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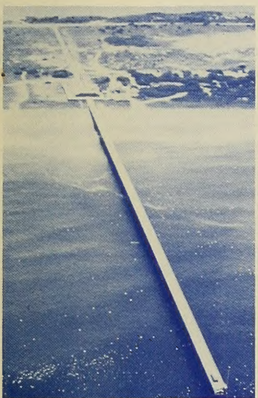

TECHNICAL REPORT CERC-85-3

ANNUAL DATA SUMMARY FOR 1981 CERC FIELD RESEARCH FACILITY

by

H. Carl Miller, William E. Grogg, Jr., J. Ross Rottier, Michael W. Leffler, and C. Ray Townsend III

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This report provides basic data and summaries of measurements made during 1981 at the US Army Engineer Waterways Experiment Station (WES) Coastal Engineering Research Center's (CERC's) Field Research Facility (FRF) at Duck, N. C. The report is the third in a series of annual summaries of data collected at the FRF. The first, summarizing data collected during 1977-79, was published as CERC Miscellaneous Report 82-16; the second, for 1980 data, was

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PREFACE

Data and data summaries presented herein were collected during 1981 and compiled at the US Army Engineer Waterways Experiment Station (WES) Coastal Engineering Research Center's (CERC's) Field Research Facility (FRF) in Duck, N. C. This report is the third of a series of annual FRF data summaries carried out under CERC's Waves and Coastal Flooding Program.

The report was prepared by H. Carl Miller, oceanographer, under the supervision of Curt Mason, Chief, FRF Group, Research Division. William E. Grogg, Jr., electronics technician, assisted with instrumentation. J. Ross Rottier, oceanographer; Michael W. Leffler, civil engineering technician; and C. Ray Townsend III, amphibious vehicle operator, assisted with data collection and analysis. Drs. Robert W. Whalin and Lewis E. Link, Chief and Assistant Chief, respectively, of CERC, and Dr. James R. Houston, Chief, Research Division, provided general guidance.

In addition, a special thank you is extended to the National Oceanic and Atmospheric Administration (NOAA)/National Weather Service, who helped with the anemometer, and to NOAA/National Ocean Service, who maintained the tide gage and provided analysis results.

Commander and Director of WES during the publication of this report was COL Robert C. Lee, CE; Mr. F. R. Brown was Technical Director.

CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF FIGURES (Continued)

LIST OF FIGURES (Concluded)

ANNUAL DATA SUMMARY FOR 1981

CERC FIELD RESEARCH FACILITY

PART I: INTRODUCTION

1. The US Army Engineer Waterways Experiment Station (WES) Coastal Engineering Research Center's (CERC's) Field Research Facility (FRF) located on 176 acres* at Duck, N. C. (Figure 1), consists of a 561-m-long research pier and an accompanying office building. The FRF is located near the middle of Currituck Spit along a 100-km unbroken stretch of shoreline extending south from Rudee Inlet in Virginia to Oregon Inlet, N. C. It is bordered by the Atlantic Ocean to the east and Currituck Sound to the west. The Facility is designed to (a) provide a rigid platform from which waves, currents, water levels, and bottom elevations can be measured, especially during severe storms; (b) provide CERC with field experience and data to complement laboratory and analytical studies and numerical models; (c) provide a manned field facility for testing new instrumentation; and (d) serve as a permanent field base of operations for physical and biological studies of the site and adjacent region.

2. The research pier is a reinforced concrete structure supported on 0.9-m-diam steel piles spaced 12.2 m apart along the pier length and 4.6 m apart across the width. The piles are embedded approximately 20 m below the ocean bottom. The pier deck is 6.1 m wide and extends from behind the dune line to about the 6-m water depth contour at a height of 7.8 m above National Geodetic Vertical Datum (NGVD). The pilings are protected against sand abrasion by concrete erosion collars and against corrosion by a cathodic system.

3. An FRF Measurements and Analysis (FRFMA) program has been established to collect basic oceanographic and meteorological data at the site, reduce and analyze these data, and publish the results.

4. This report is the third in a series of annual reports and summarizes the data collected during 1981. Data for 1977-1979 and 1980 are summarized in Miller 1982 and 1984, respectively. This report is organized such that descriptions of the instrumentation, including sensor calibration and maintenance (Part III) and data collection and analysis techniques (Part IV) precede reporting of the data (Part V). Appendixes A-D present, respectively,

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* To convert acres to hectares, use a conversion factor of 0.40469.

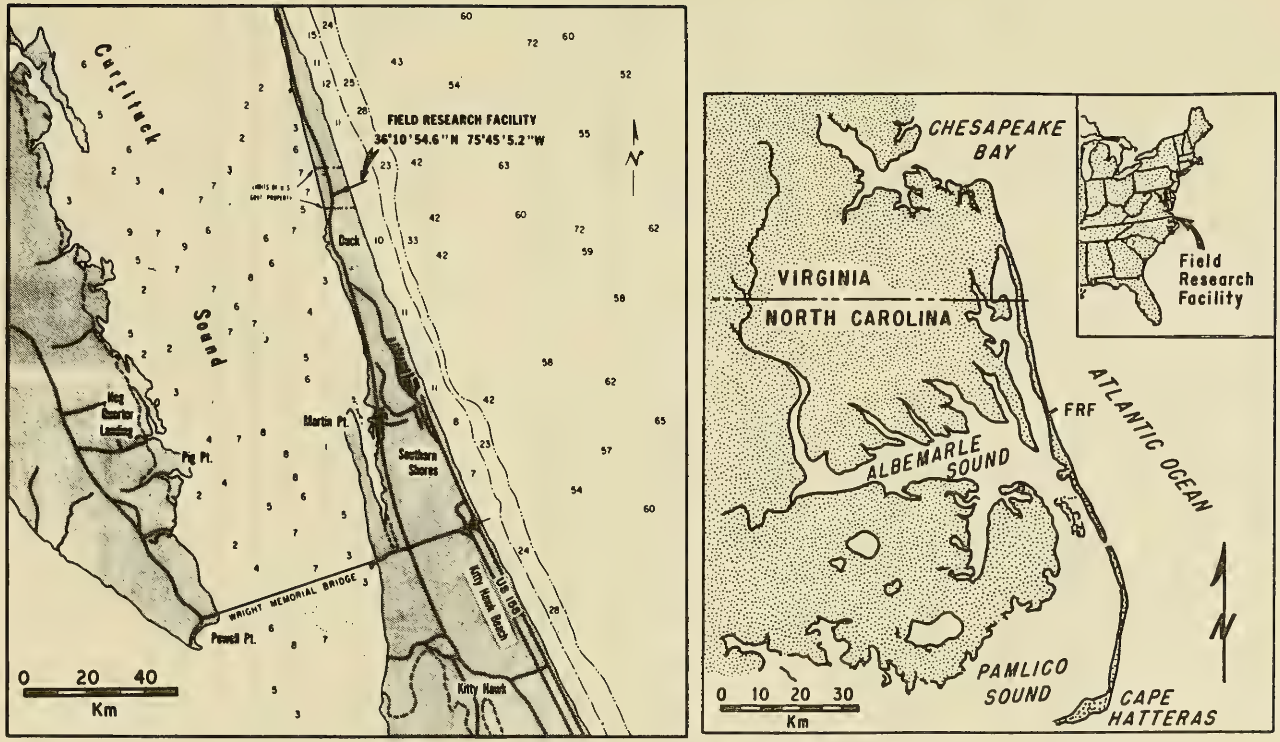


Figure 1. Location of Field Research Facility

the following material: calibration and maintenance information for the Waverider buoy gages used to monitor waves; monthly and annual 1981 wave data; bathymetric contour diagrams and bottom elevation time histories for selected locations under the FRF pier; and meteorological and oceanographic data for 1981 storms. Although this is intended as a stand-alone document, details of some procedures and instrumentation are given in the references.

5. Future annual reports will have approximately the same format; readers' comments on the format and usefulness of the data presented are encouraged.

6. In addition to the annual reports, monthly data reports summarizing the same types of data shortly after the data are collected are available to requesters from the following address:

Chief
Field Research Facility
SR Box 271
Kitty Hawk, NC 27949

7. The CERC Coastal Engineering Information Analysis Center (CEIAC) is responsible for storing and disseminating most of the data presented or alluded to in this report. All data requests should be submitted in writing to:

Commander and Director
US Army Engineer Waterways Experiment Station
ATTN: CEIAC
PO Box 631
Vicksburg, Miss. 39180

Tidal data other than the summaries in this report should be obtained directly from the Tide Analysis Branch, National Ocean Service (NOS), Rockville, Md. 20850. A complete explanation of the exact data desired for specific dates or times will expedite filling any request; an explanation of how the data will be used will help CEIAC or NOS determine if other relevant data are available. For information regarding the availability of data, contact CEIAC at (601) 634-2017. Costs for collecting, copying, and mailing will be borne by the requester.

PART II: CLIMATOLOGICAL SUMMARY

Climate

8. The FRF enjoys a typical marine climate which moderates the extremes of both summer and winter. Average air temperatures in the coldest months, January and February, are near 5° C; during the warmest months, July and August, temperatures are near 27° C. Ocean water surface temperatures at the FRF tend to be lowest in February, averaging 4° C, and highest in September, with an average of 23° C. Because of this lag in the response of the ocean to temperature change, diurnal air temperature differences tend to be greatest in the late spring and fall.

9. Precipitation annually averages 1,009 mm and is generally well-distributed throughout the year. Frontal precipitation from midlatitude cyclones predominates in the winter, while local convection (thunderstorms) accounts for most of the summer rainfall.

10. Winds at the FRF have a distinctly seasonal distribution, being generally from the north and northeast in the fall and winter and from the southwest in the spring and summer. The occasional fall and winter storms (northeasters) can produce winds with average speeds of 15 m/sec or more. Besides these midlatitude storms, tropical cyclones (hurricanes) can enter the area. Although the portion of the North Carolina coast in the vicinity of the FRF experiences a fairly low occurrence of direct hurricane strikes (once every 42 years), more frequent near-misses can cause high wave conditions at the FRF.

Waves

11. Wave directions at the FRF, as with winds, are seasonally distributed. Waves are predominantly from the northeast in the fall and winter and approach from the southeast in the spring and summer.

12. The annual mean wave height (measured at the seaward end of the FRF pier) is 0.9 m, with a standard deviation of 0.6 m. Wave heights are generally smallest in spring and summer and greatest in fall and winter.

13. Wave periods vary throughout the year between about 5 and 16 sec, with an annual mean peak spectral period of 8.7 sec and a standard deviation of 2.9 sec.

Nearshore Currents

14. Longshore currents inside the breaker line are associated in direction and strength with wave height and direction, being generally strongest and to the south (though with frequent reversals) in fall and winter and more predominantly to the north in spring and summer.

15. Rip currents occur frequently in the area, especially at cuts in the offshore sandbar, such as the one underneath the pier.

Tides and Water Level Changes

16. Ocean tides at the FRF occur semidiurnally, with a mean range of 1.0 m. Local mean sea level (MSL) since 1978 has been 8 cm above the 1929 NGVD. Water levels in Currituck Sound are wind-dominated rather than tidal, being low when winds are northeasterly and high when they are southwesterly.

Sediment Size

17. Offshore material decreases in mean grain size and becomes increasingly well sorted with distance from shore. Mean sizes vary from 0.4 mm (1.31 phi) near the shore to 0.12 mm (3.11 phi) at the 15-m-depth contour, about 2,000 m offshore.

18. Mean grain size of beach sand decreases from 0.52 mm (0.9 phi) at the mean low water (MLW) line to 0.38 mm (1.4 phi) at the dune. The sediment has a bimodal distribution of coarse material mixed with much finer sands. Mean foreshore sand sizes are smallest in the summer when wave energies are lowest.

Bathymetry

19. Nearshore bathymetry at the FRF is characterized by regular shore-parallel contours, a moderate slope, and two bars, with a wide outer bar and a well defined inner bar. This pattern is interrupted in the immediate vicinity of the pier by a shallow trough which runs the length of the pier, ending in a scour hole under the seaward end of the pier which measures up to 3.0 m deeper than the adjacent bottom.

PART III: INSTRUMENTATION

20. This section identifies the instruments used for long-term monitoring of oceanographic and meteorological conditions and briefly describes their design, operation, and location. More detailed explanations can be found in Miller (1980). Equipment (i.e., the surveying system) used for collecting other types of data is discussed in Part IV.

Wave Gages

Baylor wave staff gages

21. Two parallel cable inductance wave gages, manufactured by the Baylor Company, Houston, Tex., were mounted on the FRF pier, one at sta 6+20 and one at 19+00 (Figure 2). These rugged and reliable gages required little maintenance except to keep tension on the cables and to remove any material which could have caused an electrical short circuit between the cables. They were calibrated prior to installation by placing an electrical short between the two cables at known distances along the cables and noting the voltage output. In the field, electronic signal conditioning amplifiers were used to ensure that the output signals from the gages were within a 0- to 5-V range. Gage accuracy was about 1 percent, with a 0.1 percent full-scale resolution. These gages were susceptible to lightning damage, but protective measures have been taken to minimize such occurrences.

Waverider buoy wave gages

22. Two Waverider buoy gages were positioned 0.6 and 3 km offshore at the FRF (Figure 2). These gages, manufactured by the Datawell Laboratory for Instrumentation, Haarlem, Netherlands, measured the vertical acceleration produced by the passage of a wave. The signal was doubly integrated to produce a displacement signal, which was transmitted by radio to an onshore receiver. The manufacturer stated that wave amplitudes are correct to within 3 percent of their actual value for wave frequencies between 0.065 and 0.5 Hz (15- to 2-sec wave periods); however, calibration curves for buoys used at the FRF indicated that the wave heights reported in Part V of this report for wave periods less than 15 sec averaged about 5 percent less than actual values. For wave periods greater than 15 sec, this error was appreciably more, although waves of this type occurred less than 1 percent of the time at the

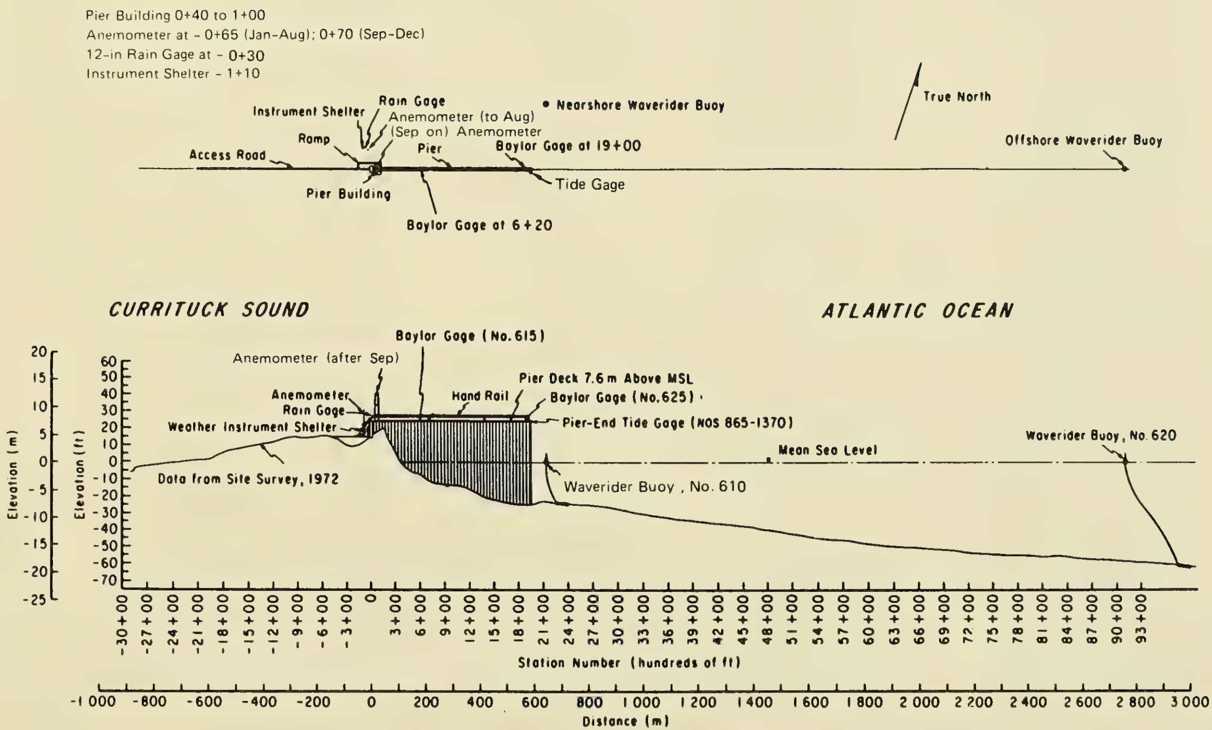


Figure 2. FRF instrumentation locations

FRF. For most engineering applications, a 5 percent error may be acceptable, but a correction procedure described in Appendix A will reduce such errors to 4 percent or less.

Tide Gages

23. Water level data were obtained from a National Oceanic and Atmospheric Administration (NOAA)/NOS control station (No. 865-1370) located at the seaward end of the research pier, using a digital tide gage manufactured by Leupold and Stevens, Inc., Beaverton, Oreg. The Leupold-Stevens analog-to-digital recorder, a float-activated, negator-spring, counterpoised instrument, mechanically converted the vertical motion of a float into a coded, punched paper tape record. The below-deck installation at pier sta 19+60 (Figure 2) consisted of a 30.5-cm-diam stilling well with a 2.5-cm orifice and a 21.6-cm-diam float.

24. This tide gage was checked daily for proper operation of the punch mechanism and accuracy of the time and water level information. The accuracy was determined by comparing the gage level reading to a level read from a reference electric tape gage. Once a week, a heavy metal rod was lowered down the stilling well and through the orifice to ensure free flow of water into the well. During the summer months, when biological growth was most severe, divers inspected and cleaned the orifice opening as required.

25. Quarterly, a NOAA/NOS tide "party," which consisted of NOS personnel familiar with the installation and equipment, performed a tide station inspection and review. The tide gage was surveyed in from existing NOS control positions, and the equipment was checked and adjusted as needed. NOS and FRF personnel reviewed procedures for tending the gage and handling the data. Any specific comments on the previous months of data were discussed to ensure data accuracy.

Meteorological Instruments

Anemometer

26. Winds were measured using a Weather Service Model F420C anemometer consisting of a cup rotor and spread-tail wind vane located on the top of the laboratory building at an elevation of 19.1 m (Figure 2). The accuracy of the

speed transmitter and indicator assemblies was (a) 1 percent up to 100 m/sec and (b) 2 percent over 100 m/sec. The wind direction transmitter and indicator assemblies were accurate to ± 5 deg at an airspeed of 0.26 m/sec or greater.

27. In April, NOAA/National Weather Service (NWS) personnel calibrated the speed cups and verified that the direction was referenced to true north. The speeds were found to be approximately 13 percent (linear) faster than actual, and the instrument was reset. Generally, speeds lower than the manufacturer's specifications for this anemometer are due to deterioration of bearings; however, speeds found faster than specified usually are due to an accidental shift of the chart recorder calibration. The chart calibration is controlled by a lever which could easily have been bumped when chart paper was changed at the end of the month. It is suggested that the data reported here be scaled lower by 13 percent for January through 23 April.

28. The wind speed and direction were recorded on a battery-powered Esterline-Angus recorder. Problems with the recorder's clock and tape-advance mechanism and the pen actuator (for indicating direction) were frequently found, and the unit required day-to-day maintenance. Maintenance of the anemometers consisted of troubleshooting the recorders and resetting the instrument based on the calibration results.

Microbarograph

29. This recording instrument, an aneroid sensor used to measure atmospheric pressure, responded to pressure changes on the order of 0.169 mb. The microbarograph, manufactured by the Belfort Instrument Company, Baltimore, Md., was located inside the laboratory building, 9 m above NGVD (Figure 2).

30. The microbarograph was compared to an NWS aneroid barometer daily; infrequent adjustments were made as necessary. The microbarograph required very little maintenance except that required to ink the pen and wind the clock every 3 days when the chart paper was changed.

Maximum/Minimum thermometers

31. NWS maximum and minimum thermometers were used to determine the daily extreme air temperatures. The thermometers were housed in an NWS instrument shelter located 43 m behind the dune (Figure 2). The shelter was designed with louvered sides, a double roof, and a slatted bottom for housing instruments requiring protection from direct sunlight.

32. The actual temperature readings at the time the thermometers were read (i.e., the present temperature) were compared to ensure accuracy of

maximum and minimum values. Maintenance consisted of periodically removing and cleaning the thermometers with soap and clean water and lubricating the Townsend support used to hold and reset the instruments.

Rain Gage

33. A 30-cm weighing rain gage manufactured by the Belfort Instrument Company, Baltimore, Md., used to measure the daily amount of precipitation, was located near the instrument shelter 46 m behind the dune (Figure 2). The manufacturer's specifications indicated that the instrument accuracy was ± 0.5 percent for precipitation amounts less than 15 cm and ± 1.0 percent for amounts above 15 cm.

34. A 15-cm-capacity "true check" clear plastic rain gage with a 0.025-cm resolution, manufactured by the Edwards Manufacturing Company, Alberta Lea, Minn., was used to monitor the performance of the weighing rain gage. This gage, located near the weighing gage, was checked daily, and very few discrepancies were identified throughout the year. The weighing rain gage required little maintenance except to wind the clock and ink the pen.

Sling psychrometer

35. A sling psychrometer was used to measure wet and dry bulb temperatures for determining relative humidity and dew point. The psychrometer consisted of two thermometers mounted in a frame; a moistened muslin wick was attached to the bulb (i.e. wet bulb) of one of the thermometers, and the device was whirled to ventilate both thermometers. After the wet and dry bulb temperatures were read, a set of NWS tables was used to determine the dew point.

36. These thermometers required little maintenance except that required to change the muslin wick every month or two and to clean the sling and thermometers with soap and water. The instruments were not calibrated, but the thermometers were compared daily to detect any bias or malfunction.

Pyranograph

37. A mechanical pyranograph, manufactured by the Weather Measure Corporation, Sacramento, Calif., was located on top of the weather instrument shelter and provided a record of the duration and intensity of solar radiation. The pyranograph was not calibrated but was observed to operate in a reasonable manner. This equipment required that the glass cover be cleaned, the chart paper changed every week, the timer wound, and the pen inked.

PART IV: DATA COLLECTION AND ANALYSIS TECHNIQUES

38. In this section, the FRF data acquisition system, data collection techniques, and data analysis procedures are discussed.

Digital Wave Data

Data acquisition system

39. The data acquisition system consisted of primary and backup data collection equipment and associated electronics for signal conditioning prior to recording. The primary system was a Data General NOVA-4 minicomputer located in the FRF laboratory building. The backup system consisted of a Lockheed Store 7 (FM) recorder which was used infrequently to record data when the primary system was not operational. During storm conditions, the backup system was run simultaneously with the primary system to ensure that wave data were obtained. Each wave gage signal was first amplified and biased to ensure a 0- to 5-V range and then input to the collection equipment. However, since the backup FM recorder operates on a maximum output of 3 V, the signal was linearly scaled by a factor of 3/5.

Collection

40. The signals from the wave gages were routinely sampled four times per second for 20 min every 6 hr beginning as near as possible to 0100, 0700, 1300, and 1900 hours Eastern Standard Time (EST); these hours corresponded to the times that the NWS created daily synoptic weather maps. During storms, hourly data recordings were made.

Data tapes

41. The wave data were recorded in digital form on 9-track tapes with the following basic tape file format: two records of header information which include (a) the station identification number; (b) the date and time; and (c) calibration and signal bias factors followed by 13 records of data for each 20-min recording interval. Each record contained 384 20-bit integer words (i.e. binary format); each integer word represented the computer units corresponding to the instantaneous voltage output of the sensor. The above sequence of 15 records per file was repeated for each sensor and recording interval, until the data tape was filled, for a total of 600 to 700 files. The 20-bit word size is unusual but was necessary because CERC processed the

data on a CDC 6600 machine with a 60-bit word size; when necessary, CERC converted the data tapes to an ASCII format.

Analysis/Summarization procedures

42. The CERC procedure for analyzing and summarizing digital wave data was based on a Fast-Fourier Transform (FFT) spectral analysis procedure. The final results were subjected to human editing and quality control before public distribution (Thompson 1977; Harris 1974). The computer analysis routine used 4,096 data points (1,024 sec of data sampled four times per sec) for each data file processed.

43. The program computed an initial distribution of the data along with the first 5 moments of the distribution function and then edited the digital data file, checking for data points out of the 0- to 5-V range, "jumps," and "spikes." A jump is defined as a data value in excess of 2.5 standard deviations from the previous data point, while a spike is a data point 5 standard deviations or more from the mean. If fewer than 5 jumps, spikes, or points out of range, in a row, were found, the program linearly interpolated between acceptable data and replaced the erroneous data points. If either more than 5 in a row or a total of 100 bad data points for the file were found, the program (a) stopped interpolation and further editing, (b) analyzed the data, and (c) printed a flag indicating there was a problem with this data file. A variance of less than 0.001 sq m indicated that the waves were calm; therefore the record was not analyzed.

44. After editing, the distribution function and first 5 moments of the sea surface elevations were again computed. A cosine bell data window was applied to increase the resolution for the energy spectrum of the file (use of the data window is discussed by Harris (1974)). After application of the data window, the program computed the variance spectrum (energy spectrum) using an FFT procedure.

45. The symbols H_{m_o} (defined as four times the standard deviation of the sea surface elevation) and T_p (defined as that period associated with the maximum energy density in the spectrum (Thompson 1977)) provided a convenient way to characterize the wave conditions contained in the data file; they were more conducive to statistical summarization than the more complete, but complex, description provided by the spectrum.

46. After the data files were analyzed, the results were eliminated for files that were flagged as bad or that appeared inconsistent with

simultaneous observations from nearby gage sites. Frequently, the spectrum and/or distribution function of sea surface elevations were examined to determine if the data were acceptable. After the analysis results had been edited, monthly summaries of H_{m_o} and T_p were generated for inclusion in summary reports.

Tide and Water Level Data

Collection

47. The tide and water level information was obtained from an NOS tide gage which produced a digital paper tape of instantaneous water levels sampled continuously at 6-min intervals. At the end of each month, the paper tape was removed from the recorder and mailed to NOS in Rockville, Md., for analysis.

Analysis

48. The digital paper tape records of tide heights taken every 6 min were analyzed by the Tides Analysis Branch of NOS. A Mitron interpreter created a digital magnetic computer tape from the punched paper tape. This magnetic tape was then processed on a Univac 732 computer in the following manner. First, a listing of the instantaneous tidal height values was obtained for manual checking. If errors were encountered, a computer program was used to fill in or recreate bad or missing data, using correct values from the nearest tide station and accounting for known time lags and elevation anomalies. The data were plotted, and a new listing was generated and rechecked. When the validity of the data had been confirmed, monthly tabulations of daily highs and lows, hourly heights (instantaneous height selected on the hour), and various extreme and/or mean water level statistics were generated. The MSL reported here is the average of the hourly heights throughout the month, while the mean tide level (MTL) is midway between mean high water (MHW) and MLW.

Meteorological Data

Collection

49. Each instrument used for monitoring the meteorological conditions at the FRF was read and inspected daily. For those instruments with analog chart recording capabilities the following steps were taken: (a) the pen was

zeroed (where applicable); (b) the chart time was checked and corrected, if necessary; (c) a daily reading was marked on the chart for reference; (d) the starting and ending chart times were recorded, as necessary; and (e) new charts were installed when needed. Sample chart records for the microbarograph (atmospheric pressure), rain gage, and pyranograph (solar radiation) are presented in Figure 3. The daily reading was recorded for all instruments except the pyranograph. As the instruments were read, weather information such as cloud cover, visibility, and predominant weather conditions were visually obtained. Note that the cloud cover, visibility, dew point and atmospheric pressure summaries presented in Part V were prepared from single daily observations made near 0700 EST and thus do not represent daily or hourly averages; therefore, caution should be exercised when interpreting the results.

50. The wind data provided in this report were based on wind speed and direction values determined every 6 hr from the instrument chart records and represent estimated average values based on 10 min of record.

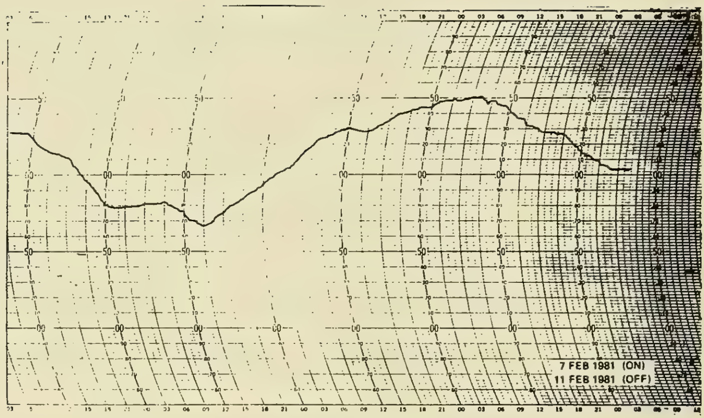
Analysis

51. Wind roses were computed for the wind speed and direction values obtained every 6 hr. The directions were specified at 22.5-deg intervals, i.e., at 16-point-compass-direction specifications. Frequency distributions (wind roses) of wind speed for each direction were computed for the entire year, each 3-month season, and monthly. Resultant directions and speeds were determined also by vector-averaging the data.

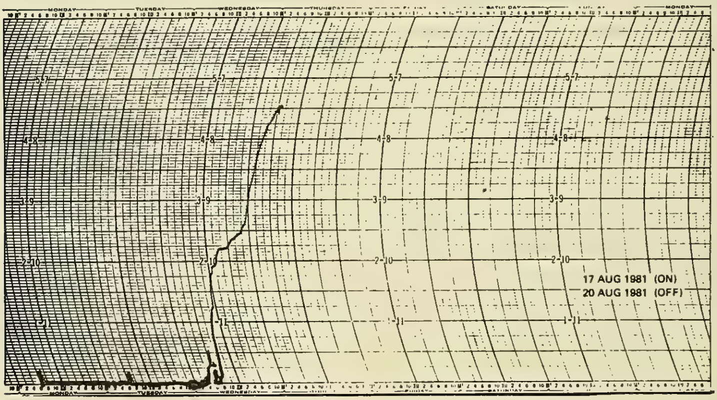
52. Dew-point values reported on herein were determined from psychrometer readings by computing the wet-bulb temperature depression (dry bulb minus wet bulb) and by using Table 19 in Appendix III of the Weather Service Observing Handbook No. 1--Marine Surface Observations (NOAA/NWS 1979).

Visual Observations

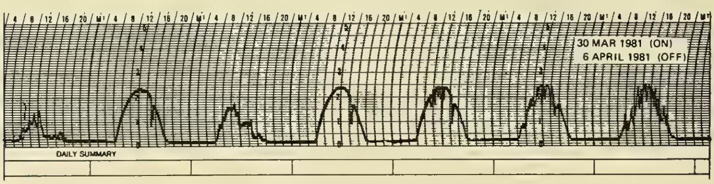
53. At the FRF, daily visual observations were made near 0700 hours to supplement instrumented data collection. These included observations of surface current speed and direction at (a) the seaward end of the pier, (b) the midsurf position on the pier, and (c) on the beach 500 m updrift of the pier. Also measured were the wave approach angle at the seaward end of the pier and the breaker angle and type nearshore.



a. Microbarograph



b. Rain gage



c. Pyranograph

Figure 3. Sample chart records for the microbarograph, rain gage, and pyranograph

Bathymetric and Pier Surveys

Collection

54. Beginning in July, a series of profiles was obtained monthly using the Coastal Research Amphibious Buggy (CRAB), a 12-m-tall amphibious tripod, and a Zeiss Elta-2 total station surveying system. Detailed characteristics of this system are presented in Birkemeier and Mason (1984). Each profile extended seaward from the baseline behind the dune to a water depth of about 10 m, and profiles were located up to 0.6 km north and south of the FRF pier. The profile lines surveyed are located and identified on each contour diagram in Appendix C. The accuracy of these surveys was about ± 3 cm horizontally and vertically. Weekly soundings along both sides of the FRF pier were performed by means of a lead line surveying technique consisting of lowering a weighted measuring tape and noting the distance below the pier deck, a known elevation above NGVD. Positions between the pier bents (i.e., every 12.2 m) were used to minimize inaccuracies due to scour near the pilings.

Analysis

55. The pier, beach, nearshore, and offshore data were reduced to position (X,Y) and depth (Z) triplets relative to the local NGVD. The data were listed, and a display of the profiles (i.e., distance along the range versus elevation) using line printer graphics was generated for visual inspection. After the data had been edited and determined acceptable, another set of routines was used to compute contour diagrams of the bottom topography and time sequences of bottom elevations at selected locations along the pier.

Sediment Data

Collection

56. Sediment data were not collected routinely at the FRF during the year. Coincident with an experiment in the fall, personnel from CERC, the US Geological Survey (USGS) in Reston, Va., and Skidaway Institute of Oceanography in Georgia, collected grab samples and box cores from the ocean, beach, and nearshore and vibracores from the sound, across the island to the ocean. The grab samples were obtained with a clam shell grab and contain samples from approximately the top 10 cm of sediment.

Analysis

57. The sediment samples were sieve-analyzed to determine the size distribution of the samples. The sieves were at 1/2-phi intervals (phi = $\log_2$ sediment diameter (mm)). This report presents a summary of the texture analysis.

Photographic Data

Aerial

58. Quarterly aerial photographic missions were performed by a contractor using a 9-in.-negative-format mapping aerial camera capable of black-and-white and color photography. All coverage was at least 60 percent overlap, with all flights flown as close as possible to periods of low tide between 1000 and 1400 hours, with less than 10 percent cloud cover.

59. The flight lines were concentrated near the FRF, although one flight line extended from Cape Henry, Va., to Cape Hatteras, N. C. The flight lines and scale specifications are shown in Figure 4.

Beach

60. As part of the visual observations, 35mm color slides of the beach were taken daily from the pier looking toward both north and south. The location from which each picture was taken, date, time, and a brief description of the picture were marked on the slides, and an inventory was maintained.

Analysis

61. There was no routine analysis of the photographic data except to inventory what was obtained.

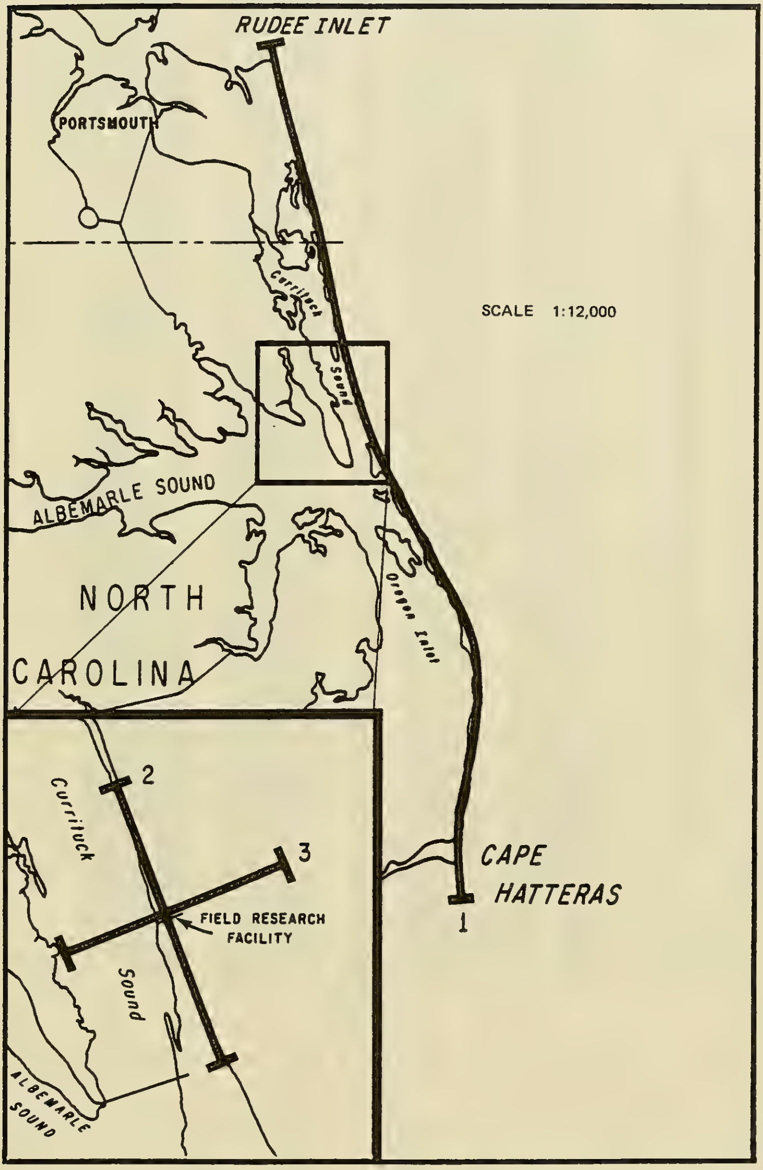


Figure 4. Quarterly aerial photography flight lines, 1981

PART V: DATA AVAILABILITY AND RESULTS

62. This part provides results of the weather, wave, surface current, tidal, water characteristic, survey, sediment, and photographic measurements made during the year. Table 1 is intended as a quick reference guide to show the dates for which various types of data are available. Wave gage histories which may explain major gaps in the data are provided in Appendix B. Although this report is intended to provide basic data for analysis by users, many of the daily observations have been summarized by month, season, and year to aid in interpretation. If individual data are needed, the user can obtain the detailed information by following the procedures described in paragraphs 6 and 7.

Meteorological Data

63. Table 2 summarizes monthly averages of the following daily measurements: cloud cover, visibility, dew point, and atmospheric pressure. Results of air temperature, precipitation, and wind speed and direction measurements for 1981, as well as prior years, are presented below. Appendix D contains hourly atmospheric pressure, wind speed, and wind direction data collected during storm conditions for 1981.

Air temperature

64. Air temperature measurements are summarized herein using the daily highest and lowest temperatures measured by maximum and minimum thermometers. Daily average temperatures are unobtainable since only one observation per day was made. The warmest months at the FRF in 1981 were June through September; the coolest months were typically January and February (see Table 2 and Figure 5. Monthly average daily high and low temperatures for 1981 were very similar to those for 1980. Annual average daily high temperature was 20° C, less than 1° C higher than for 1980. Annual average daily low temperature for both years was 11° C. As it was for 1980, the monthly range of temperatures for 1981 was the smallest during the warm summer months and as large as 31° C in February and December. These tendencies reflect the complex interaction of (a) ocean, whose temperature varies slowly, (b) winds, whose direction and speed can change very quickly, and (c) large airmasses, which can

Table 1
1981 Data Availability

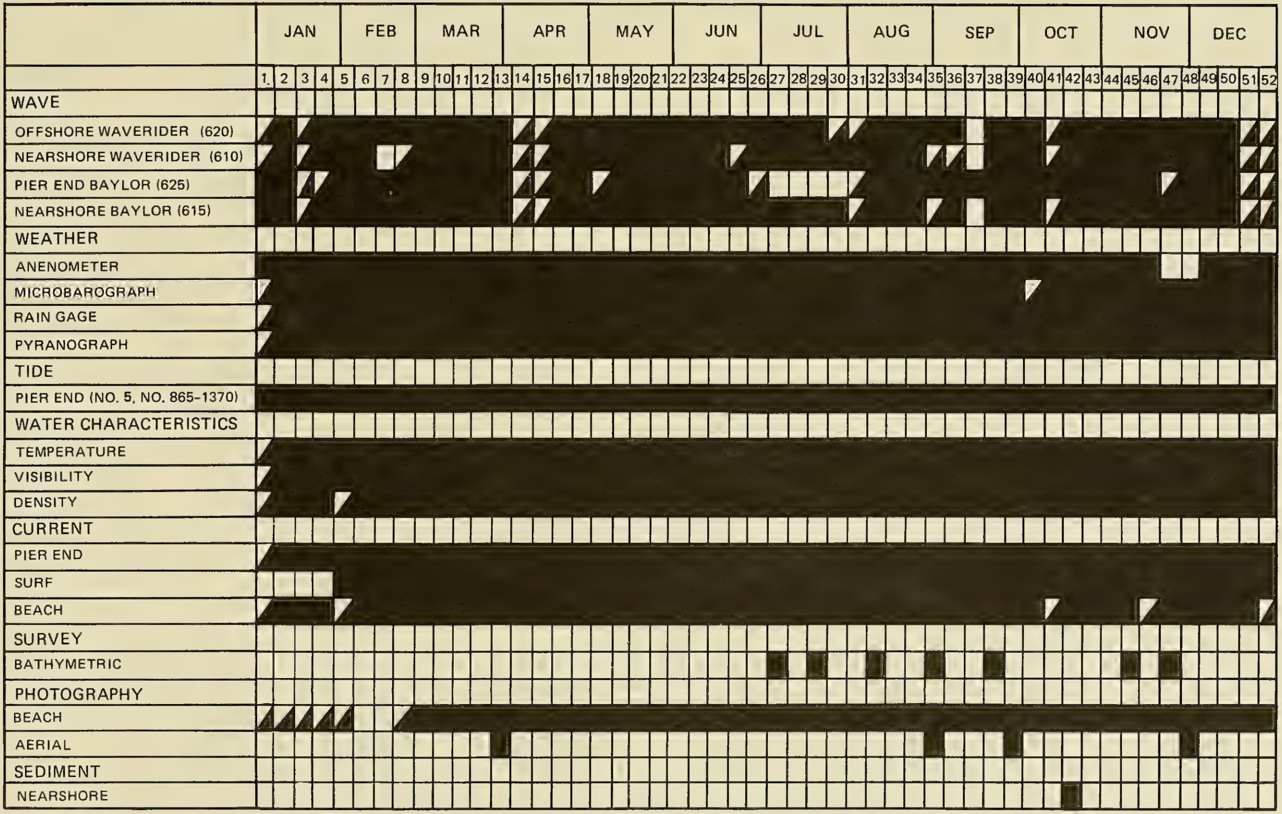


Table 2

Meteorological Data Summary for 1981

Month	Average Cloud Cover %	Average Visibility km	Average Atmospheric Pressure mb	Average High Temperature °C	Average Low Temperature °C	Average Dew Point °C	Total Amount of Precipitation mm
Jan	50	15	1019.1	6.4	-2.8	--*	45
Feb	50	14	1022.8	10.8	0.9	4	46
Mar	37	16	1015.0	12.6	3.0	2.9	48
Apr	38	18	1022.6	21.3	11.6	10.8	46
May	49	12	1015.6	22.4	13.6	14.2	43
Jun	55	15	1016.4	30.0	21.2	21.5	76
Jul	35	16	1016.5	30.2	23.2	22.3	200
Aug	52	14	1016.0	28.0	21.5	21.7	220
Sep	22	14	1016.1	26.4	18.5	17.9	5
Oct	44	15	1019.8	20.3	11.9	12.1	40
Nov	49	13	1016.4	15.0	6.6	7.4	67
Dec	61	16	1017.8	10.3	1.3	3.7	127
Average/Total for 1981	45	15	1017.8	19.5	10.9	12.6	963

* Data not available.

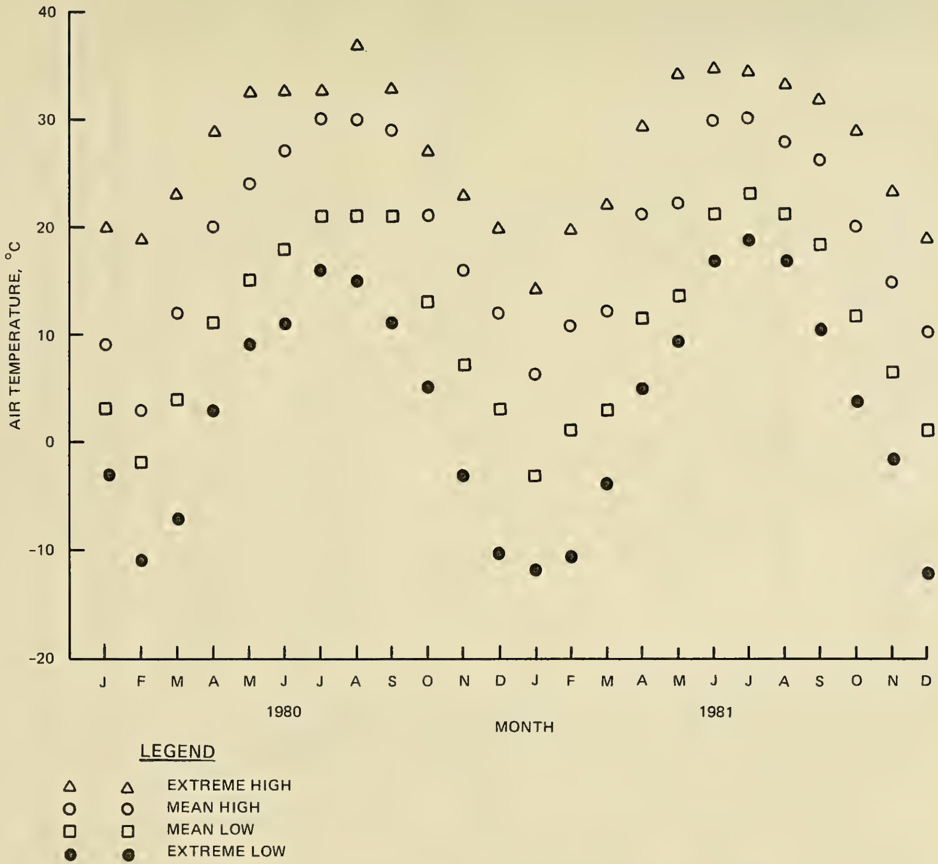


Figure 5. Monthly high and low air temperatures

come from the north, with temperatures influenced by Arctic conditions, or from the south, where tropical influences prevail. Table 3 shows the monthly extreme temperatures since 1978. Five months of 1981, including the spring (April through June), showed the highest temperatures recorded since March 1978; likewise, four months, including September, October, and December, showed the lowest temperature recorded. The average date for the first occurrence of a freezing temperature was 30 November (21 November for the past 3 years), while the average date of the last occurrence was 13 March.

Table 3

Monthly Extreme Air Temperatures Measured at FRF Since 1978

Month	Extreme High, °C	Extreme Low, °C
Jan	20	-12 (1981)
Feb	20 (1981)	-11
Mar	24	-7
Apr	30 (1981)	3
May	35 (1981)	8
Jun	35 (1981)	11
Jul	43	13
Aug	37	15
Sep	34	11 (1981)
Oct	29 (1981)	4 (1981)
Nov	24	-3
Dec	24	-12 (1981)

Precipitation

65. Unusually high precipitation during July, August, and December (Table 4) balanced an otherwise dry year, resulting in a near-normal annual total; monthly minima for the 1978-1981 period occurred six times during 1981 (Table 4). On 20 August, 115 mm of precipitation was recorded in a 24-hr period as the result of Tropical Storm Dennis (Figure 3).

Wind

66. Since local winds frequently control nearshore currents and wave conditions, an understanding of the wind and wave climates at any coastal

Table 4

Monthly Precipitation Extremes and Means,* 1978-1981

Month	1978-1981 Maxima, mm	Minima, mm	Mean, mm	1981
Jan	180	45	105	45**
Feb	94	46	69	46**
Mar	137	48	85	48**
Apr	112	46	76	46**
May	239	39	117	43
Jun	130	60	84	76
Jul	200	64	109	200†
Aug	220	36	88	220†
Sep	160	5	52	5**
Oct	73	25	49	40
Nov	130	67	98	67**
Dec	127	47	77	127
Total			1,009	963

* Monthly average: 84 mm; annual average: 1,009 mm.
** Minima for the 1978-1981 period.
† Maxima for the 1978-1981 period.

location is important to most studies of hydrodynamic and sedimentary processes. In this section, wind characteristics at the FRF are discussed based on measurements made four times per day during 1980 and 1981. Over these 2 years, the annual distribution of wind speeds and directions at the FRF showed a consistent pattern. The winds blew onshore from the north side of the pier more often (32 percent) than from the south (14 percent) (Figure 6). Winds blowing from the north side of the pier--i.e., north through east-northeast--produced onshore waves and southerly directed surface currents, while winds from the south side--i.e., east through south-southeast--produced onshore waves and northerly directed surface currents. Over 53 percent of the time, winds were directed offshore and did not produce waves onshore.

67. The strongest winds during 1980 and 1981 tended to blow from the north-northeast during January through March (Figure 7). High speeds and frequent northerly directions during October through December and January

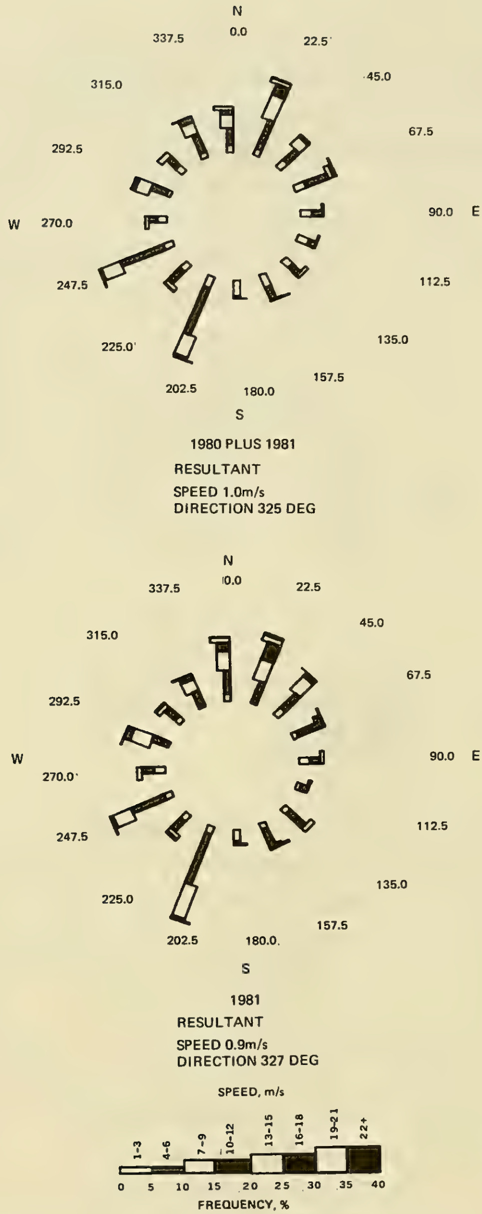


Figure 6. 1981 plus 1980 and 1981 annual wind roses for FRF, reference true north (data measured every 6 hr)

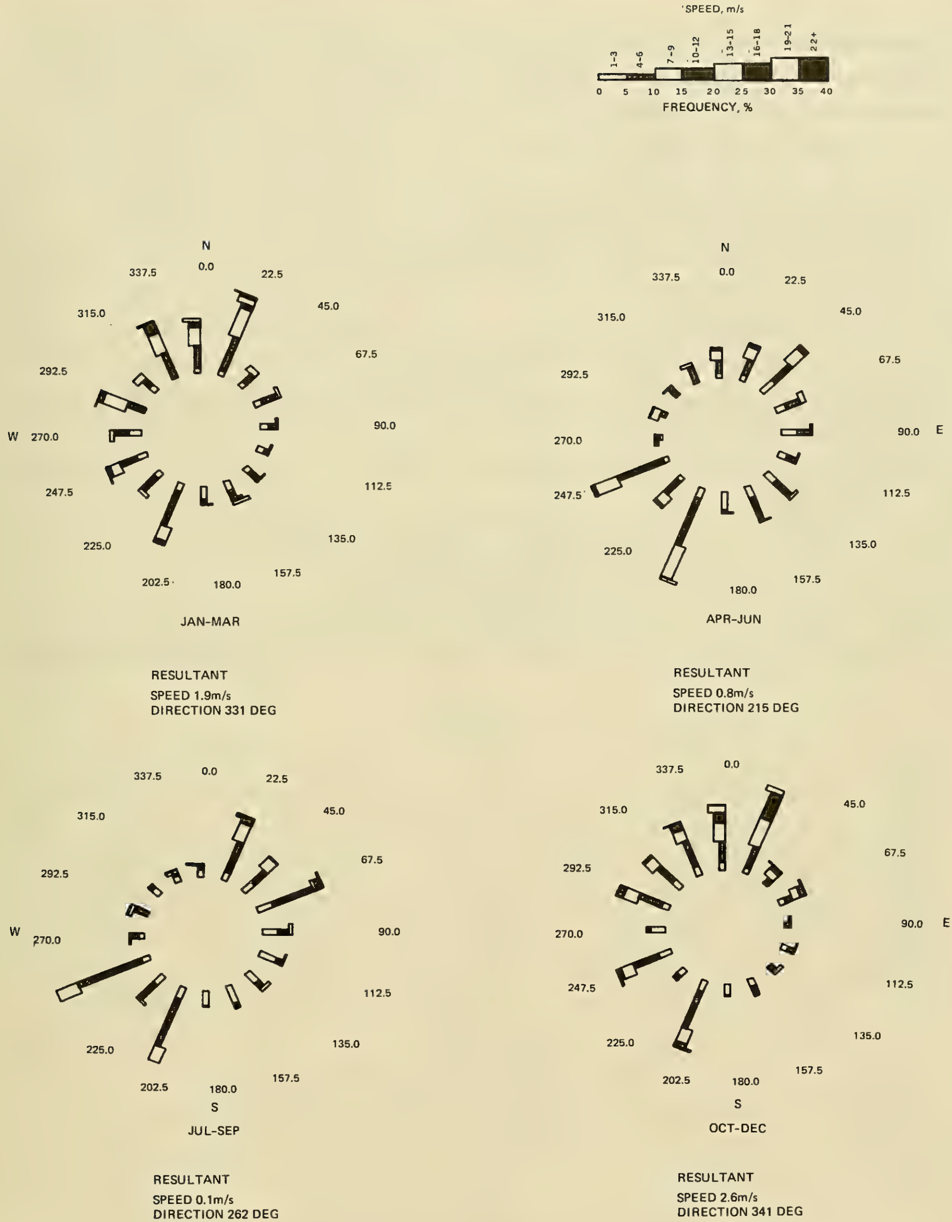


Figure 7. 1981 plus 1980 seasonal wind roses for FRF, reference true north

through March resulted from Arctic and polar high-pressure systems (clockwise circulation), as well as extratropical and tropical cyclones (low-pressure systems with counterclockwise circulation). Winds originating as continental or Canadian air masses generally move east across the US, producing initially western and finally northern/northeasterly winds along the Atlantic coast; extratropical "northeaster" storms associated with low-pressure systems tend to move north along this coast, producing strong northeasterly winds followed by winds from the northwest.

68. Wind roses (Figure 7) for the spring and summer seasons, April through September, of combined 1980 and 1981 data, showed the strong influence of the tropical maritime airmass which produces winds that blow from the southwesterly direction. The resultant wind speed and direction vectors (Table 5) show an approximate balance of speeds and directions during July

Table 5

Resultant Wind Speeds and Directions for 1980 Plus 1981

Month	Magnitude, m/s	Direction, deg True N
	Monthly	
Jan	2.5	343
Feb	1.4	318
Mar	1.8	324
Apr	1.5	217
May	0.1	63
Jun	0.9	213
Jul	0.9	202
Aug	0.8	23
Sep	0.2	285
Oct	1.9	359
Nov (1980 only)	1.9	317
Dec	2.8	334
	Seasonal	
Jan-Mar	1.9	331
Apr-Jun	0.8	215
Jul-Sep	0.1	262
Oct-Dec (no Nov 1981)	2.2	340
	Annual	
Jan-Dec (no Nov 1981)	1.0	325

through September. In January through March and October through December for combined years, the northerly direction dominated; and the magnitudes were the greatest. The strongest southerly winds occurred in April through June. As mentioned, annual wind patterns were consistent from year to year (Figure 6). The seasonal variation shown in Figure 8 for 1981 changed from southerly in the warm months to northerly in the cold with an overall western dominance as is typical; however, as Figure 9 shows, monthly patterns can vary significantly. In January 1981, the wind blew from the west and from the south-southwest much more frequently than during 1980. The frequency of winds from north through northeast was approximately the same between the years for January, but winds were much more unidirectional from the north in 1981. For 28 percent of the time during February 1981, the winds blew from the southeast, while this occurred for only 13 percent of the time during February 1980; February 1981 was the month during 1980-1981 for which winds from the southeast were most frequently observed. During July 1981, the winds were more evenly distributed than during July 1980. Other months throughout the year showed only minor differences. Monthly wind roses for the combined years 1980 plus 1981 and 1981 alone are shown in Figures 10 and 11, respectively.

Wave Data

69. This section presents summaries of the wave data collected at the FRF during 1981. Annual and seasonal statistical summaries given below show a temporal and spatial variability of the wave climate at the FRF. Appendix B contains summaries for each gage which include statistics for 1980 and 1981 data combined, wave roses, persistence tables, and sample storm spectra for dates when H_{m_o} exceeded 2.0 m at the seaward end of the FRF pier. Appendix D contains hourly wave data summaries for the storm dates in 1981.

Wave height

70. 1981 wave statistics (see tabulation below) vary as a function of gage installation: generally, as water depth (and distance from shore) increases so does the average annual H_{m_o} value.

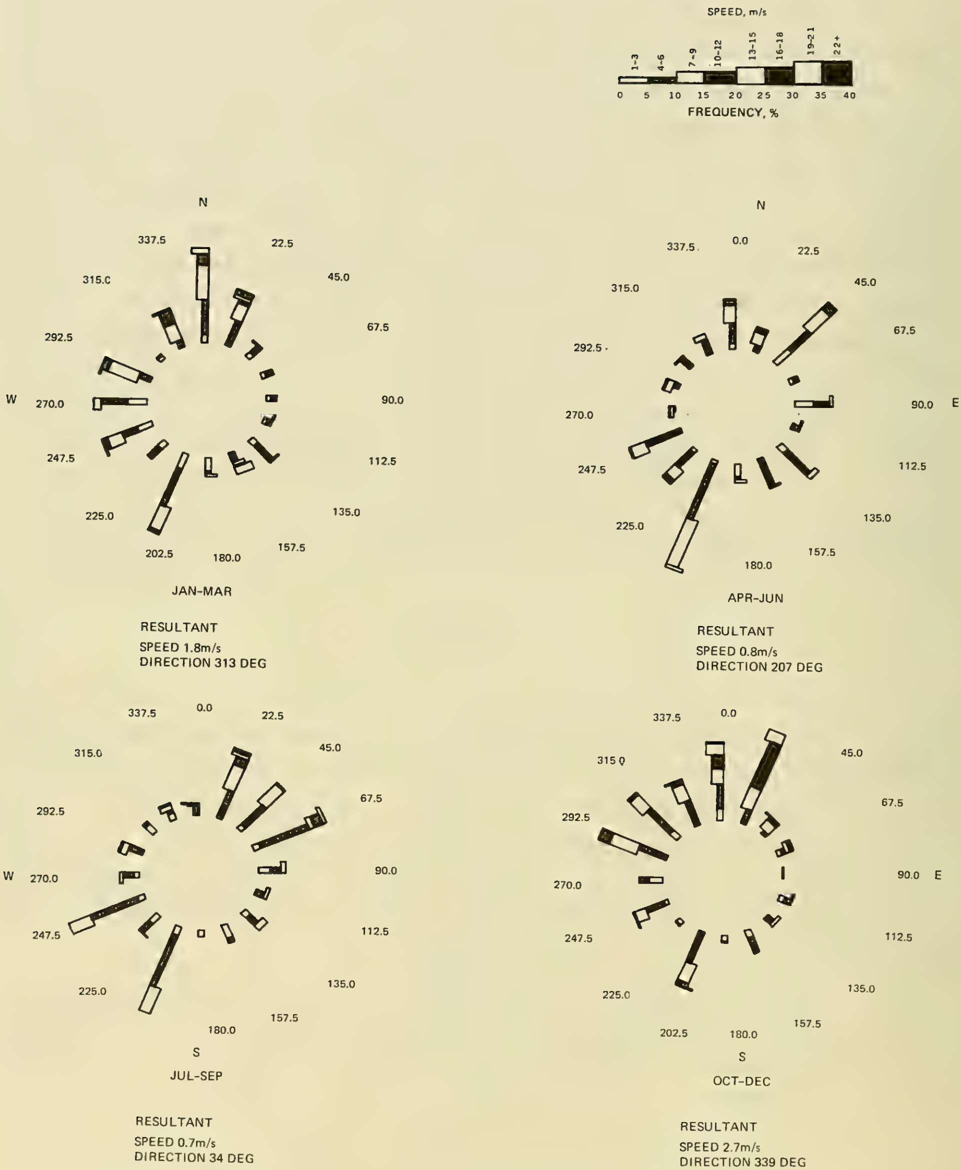


Figure 8. 1981 seasonal wind roses for FRF, reference true north

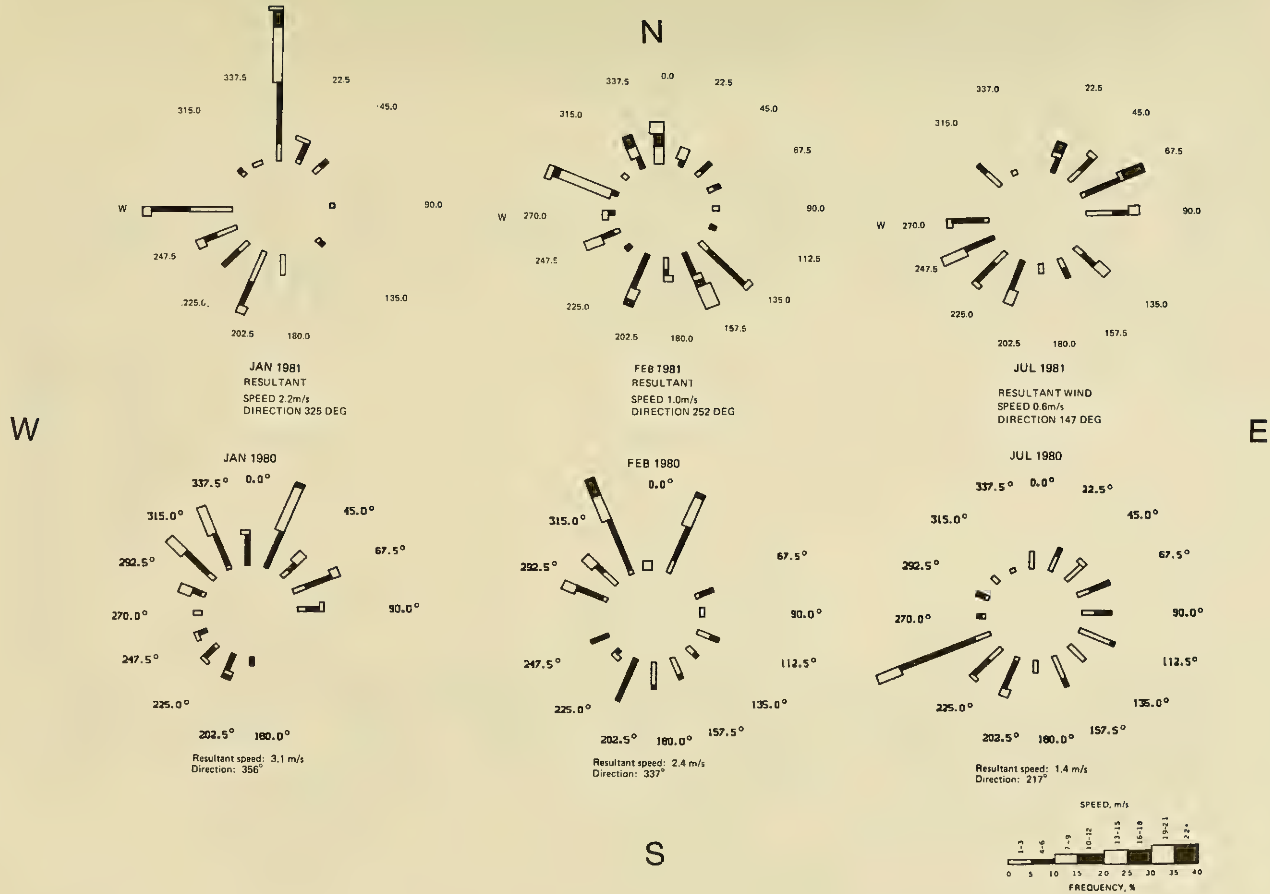


Figure 9. Wind roses for January, February, and July 1981 and 1980, reference true north

Figure 10. 1981 plus 1980 monthly wind roses for FRF, reference true north (Continued)

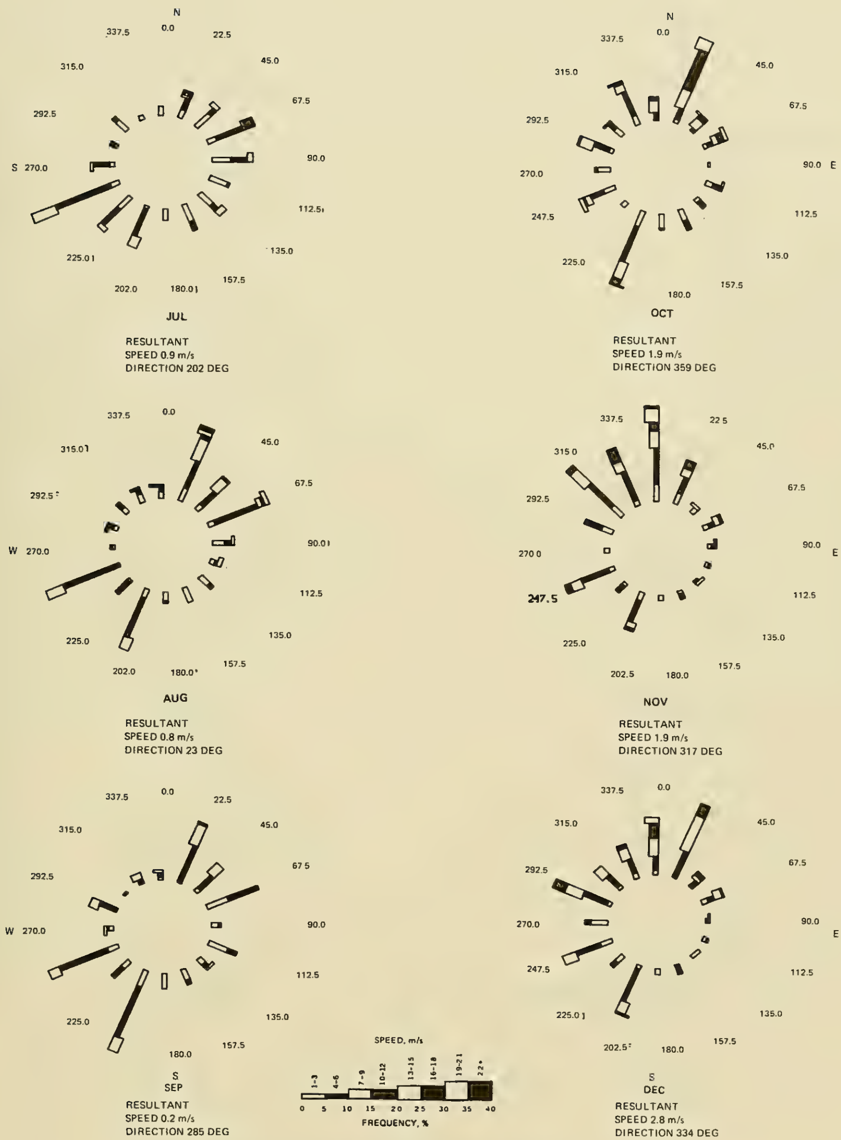


Figure 10. (Concluded)

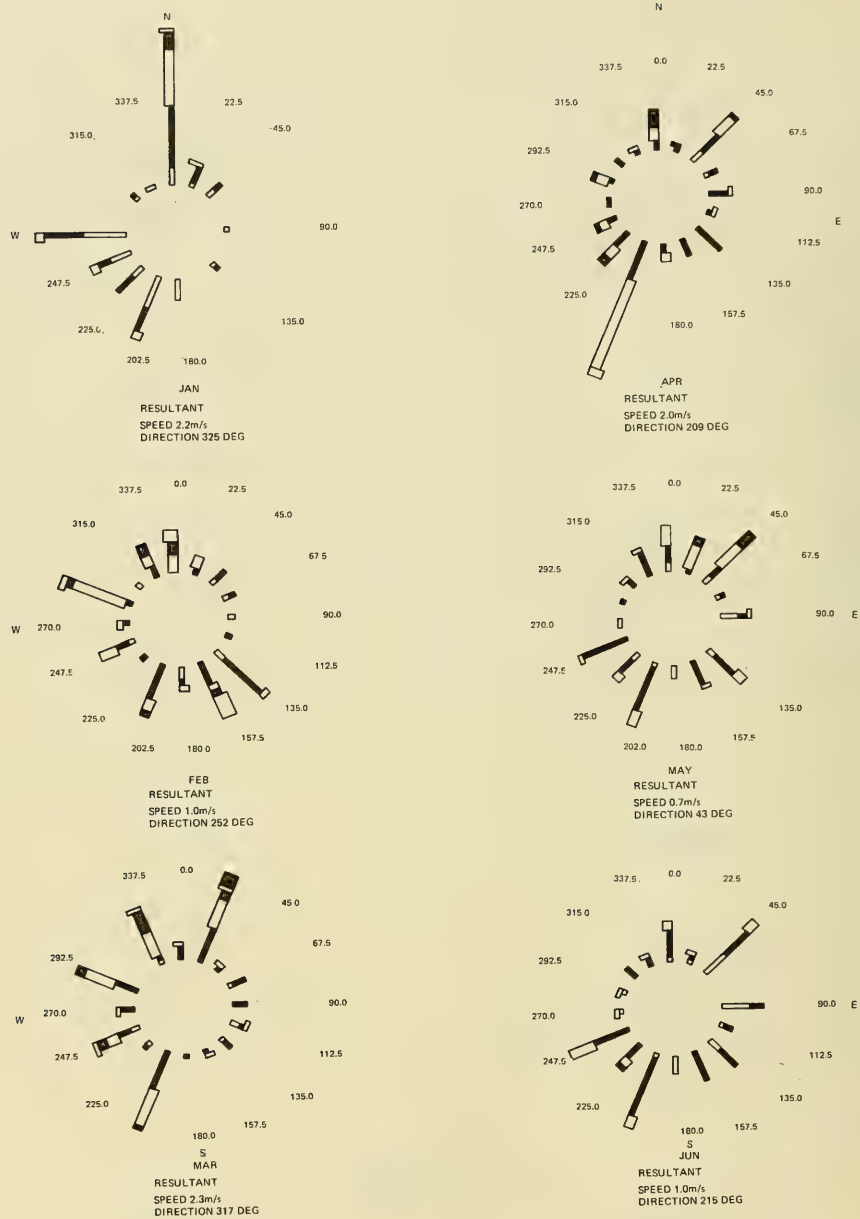


Figure 11. 1981 monthly wind roses for FRF, reference true north (Continued)

Figure 11. (Concluded)

Gage	Distance from Shore, m	Average Annual Water Depth, m	H_{m_o} Mean	H_{m_o} Std Dev, m	T_p Mean	T_p Std Dev, sec
Nearshore Baylor (No. 615)	100	2	0.7	(0.3)	7.9	(3.1)
Pier End Baylor (No. 625)	500	8	1.0	(0.6)	8.4	(2.8)
Nearshore Waverider (No. 610)	600	7	0.9	(0.6)	8.5	(2.8)
Offshore Waverider (No. 620)	3,000	18	1.0	(0.6)	8.0	(2.8)

71. Although the annual H_{m_o} values for gages 625 and 620 are the same, the distribution of H_{m_o} shows a greater frequency of large waves at the offshore gage location (Figure 12). The nearshore Baylor gage was in shallow water inside the breaker zone, even during moderate-to-low wave conditions; consequently, its statistics represent a lower energy wave climate frequently due to waves breaking seaward of the gage.

72. Wave conditions during the year varied with season. During October through December, wave heights were most severe, followed by July through

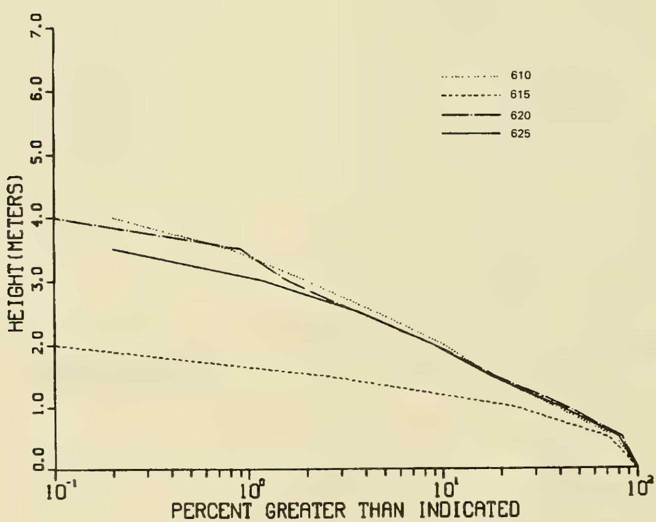


Figure 12. 1981 annual wave height distributions for all FRF gages

September and January through March; during April through June, the least severe conditions occurred (Figure 13).

73. The overall wave climate during 1981 was more severe than during 1980 (Figure 14). At gage 625 near the seaward end of the pier, 7 percent of the wave heights exceeded 2 m during 1981, while less than 5 percent did during 1980. Seasonal variation also differed from 1980. The much greater frequency of higher waves in August (Figure 15) and a succession of storms in September 1981 resulted in a much more severe summer (July through September) than 1980 (Figure 16). A mild January in 1981 was the primary reason the winter season (January through March) was less severe than the winter of 1980. These two seasons were thus reversed between years in order of severity.

74. The extreme H_{m_0} at the seaward end of the pier for 1981 was 3.5 m, which occurred in November during an extratropical northeaster storm (see Appendix D for storm data). This matched the 1980 extreme.

<u>Wave period</u>

75. Annual wave period distributions were consistent from gage to gage (Figure 17). The 1981 annual average wave period at the seaward end of the pier (gage 625) was 8.4 sec, with an associated 2.8-sec standard deviation (see tabulation, paragraph 70). Figure 18 shows the 1981 wave period

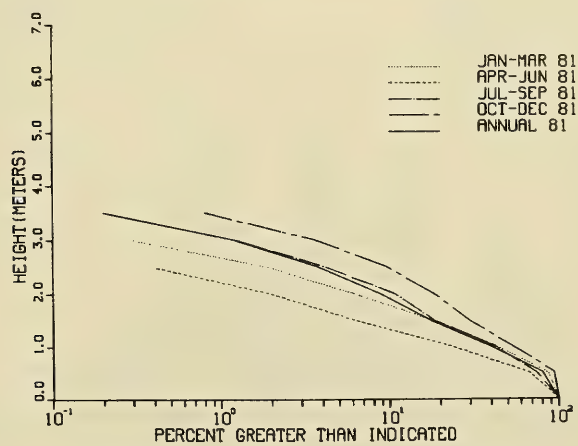


Figure 13. 1981 seasonal wave height distributions for gage 625

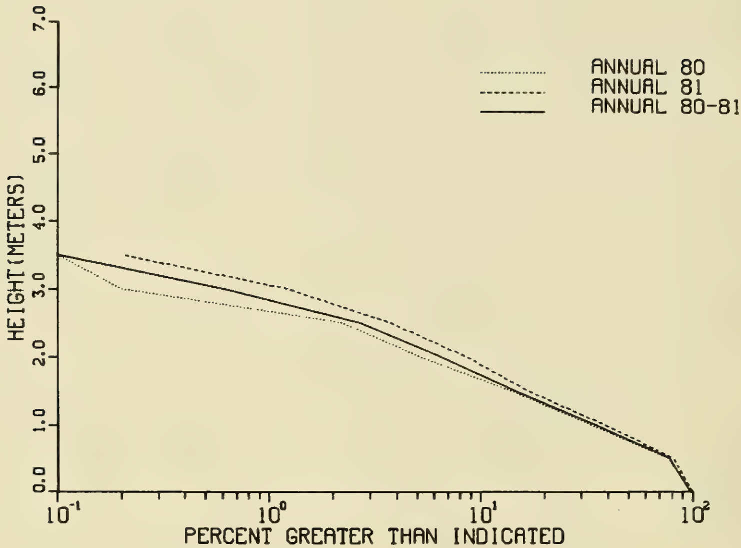


Figure 14. 1981, 1980, and 1981 plus 1980 annual wave height distributions for gage 625

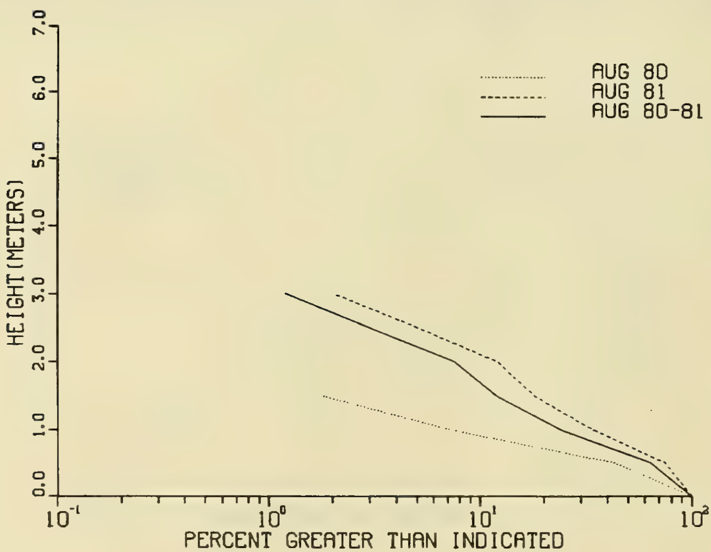


Figure 15. 1981, 1980, and 1981 plus 1980 August wave height distributions for gage 625

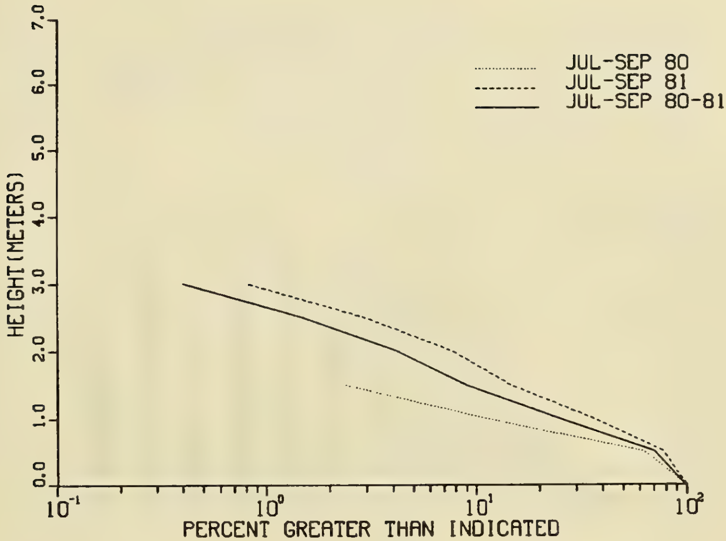


Figure 16. 1981, 1980, and 1981 plus 1980 July-September wave height distributions for gage 625

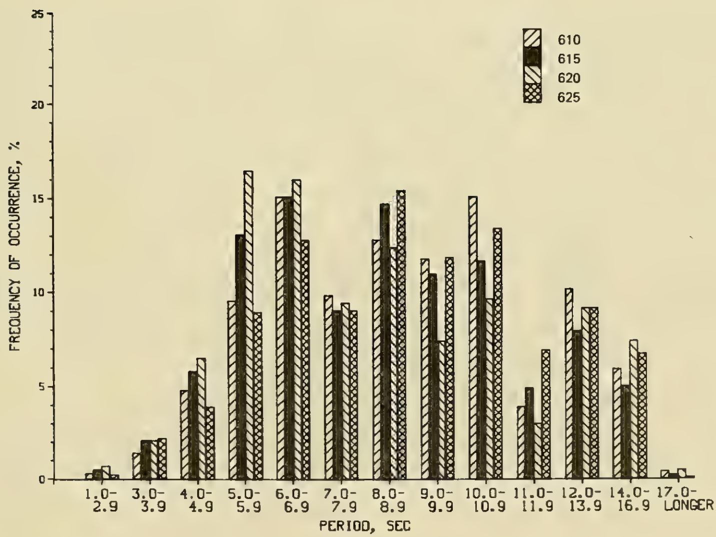


Figure 17. 1981 annual wave period distributions for all FRF gages

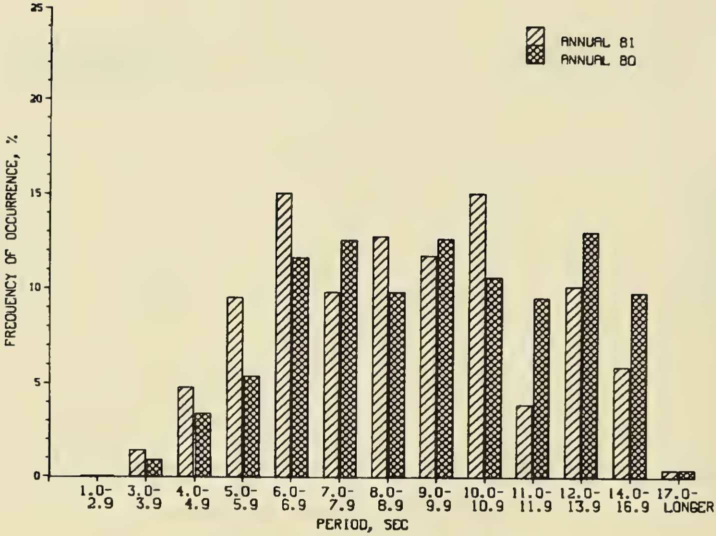


Figure 18. 1981 and 1980 wave period distributions for gage 625

distribution for gage 625. The most frequently occurring periods were 6, 8, and 10 sec (see Table 6). During storms when H_{m_0} was greater than 2 m, the periods ranged from 6 to 17 sec, although most were between 6 and 12 sec. This variation can in general be attributed to the distance of the wave-generation area from the pier; i.e., storms far offshore, say 500 km or more, tend to produce 12-sec or longer wave periods, while more local storms produce shorter periods. Based on the occurrence of periods longer than 10 sec, swell from distant generating areas may have accounted for approximately 20 percent of the conditions at the coast. During October through December, 6 sec wave periods occurred most frequently, while during April through June more than 30 percent of the wave periods were 8 sec (Figure 19).

76. With the exception of July through September, wave period distributions were consistent between 1980 and 1981. January through March tended to have longer (greater than 8 sec) periods, while during October through December, 6-sec locally generated seas predominated. A large difference was observed during July through September, when there were fewer 8-sec and more wave periods greater than 10 sec (Figure 20).

Table 6

1981 Joint Distribution of Wave Height Versus

Wave Period for Gage 625

ANNUAL
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	5	4	7	17	15	39	37	30	3	15	11	1	184
.50 - .99	.	9	37	40	65	37	61	50	63	18	30	19	.	429
1.00 - 1.49	.	.	7	35	45	33	15	15	35	6	19	10	.	220
1.50 - 1.99	.	.	.	13	19	6	4	5	13	4	9	8	2	83
2.00 - 2.49	.	.	.	.	3	4	2	6	4	6	15	8	1	49
2.50 - 2.99	.	.	.	.	1	3	5	2	3	.	9	2	.	25
3.00 - 3.49	.	.	.	.	.	.	1	2	2	2	2	1	.	10
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	2	.	.	2
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	14	48	95	150	98	127	117	150	39	101	59	4	

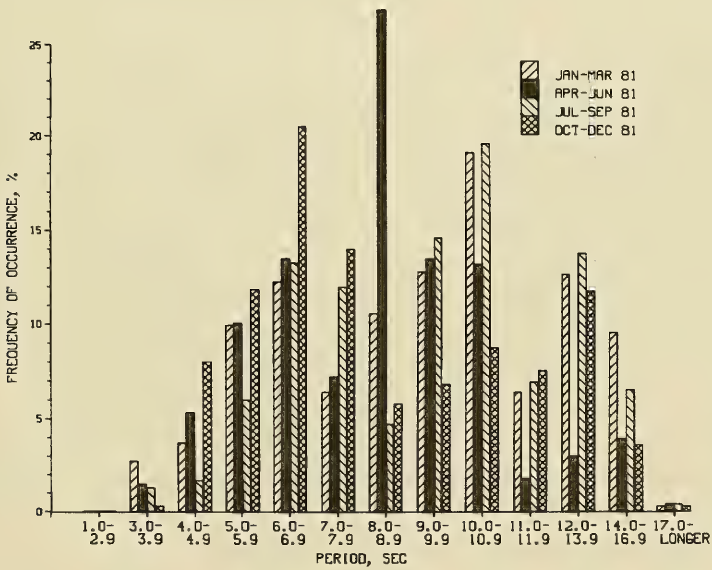


Figure 19. 1981 seasonal distribution of wave periods for gage 625

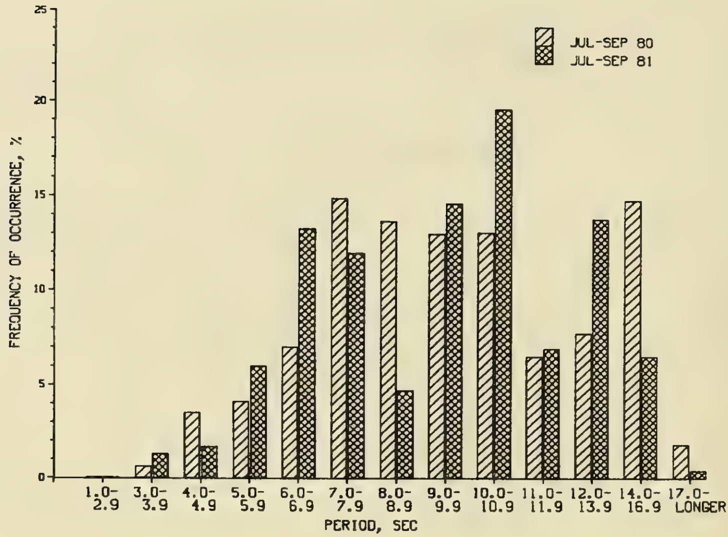


Figure 20. 1981 and 1980 summer wave period distributions for gage 625

Wave direction

77. For many engineering applications, such as sediment transport computations, an understanding of the directional characteristics of a wave field is as important as measurement of the wave energy. Visually observed angles of the primary wave train (i.e., the wave train having the largest heights) can provide qualitative climatological information useful in identifying seasonal trends in wave direction. Wave roses generated for 1981 were based on visual measurements of the direction from which the primary wave train approached relative to true north; these measurements were made daily (near 0700 EST) at the seaward end of the FRF pier. Wave height was determined from the pier-end Baylor gage (625) at a corresponding time. The angles shown here are figured relative to true north, and the pier axis (considered perpendicular to the beach at the FRF) is oriented 69°58' east of true north; consequently, wave angles greater than approximately 70 deg imply the waves were coming from the south side of the pier.

78. During 1981, 46 percent of waves approached from north of the pier, and 51 percent from south; 3 percent were shore normal (see Figure 21).

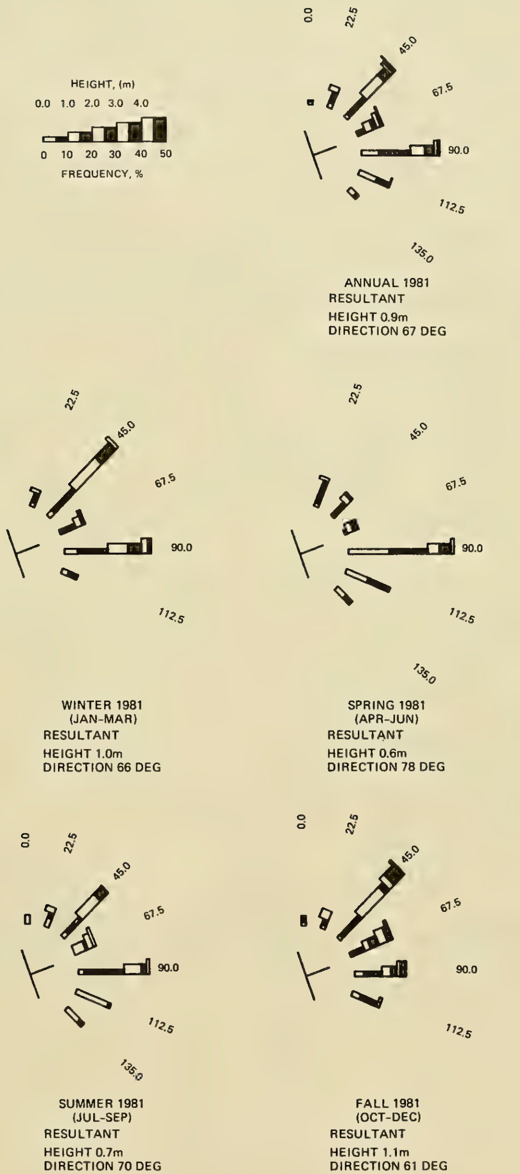


Figure 21. 1981 annual and seasonal wave roses at seaward end of FRF pier, reference true north

79. January through March and October through December were seasons with waves predominantly from the north (Figure 21). Waves approached from the south from April through September; over 70 percent of waves approached from the south during April through June.

80. As shown by the wind roses in Figures 6 and 8 and the wave roses in Figure 21, seasonal trends and the overall distribution of wave directions agree with trends in the wind climate at the FRF. In particular, an increase or decrease in northerly winds was the primary factor affecting the distribution of northerly wave directions during the year. This suggests northerly waves (which include the more severe heights) were produced most often by local winds. On the other hand, variation in the frequency of waves from the south frequently were not consistent with the observed onshore winds from the south. In September, for example, there were few southern, onshore winds, but substantial wave action approaching the shore from directions south of the pier (Figure 22). This resulted from three tropical storms which developed well offshore to the south of the FRF and produced swell from that direction.

81. Overall, waves approached from south of the pier 5 percent more frequently during 1981 than during 1980. Despite similar seasonal tendencies for northerly waves in January through March and October through December and southerly waves for April through September, monthly variations of northerly and southerly directions were large throughout the years.

82. Differences are emphasized by the resultant vector wave height magnitudes and directions tabulated below. These resultants were computed by vector-averaging the daily wave height and direction vectors.

Season	Resultant Magnitude, m		Resultant Direction Ref True North	
	1981	1980	1981	1980
January-March	1.0	0.9	66	52
April-June	0.6	0.6	78	70
July-September	0.7	0.6	70	75
October-December	1.1	0.9	61	46

83. During January through June 1981, more waves arrived from the south than during the same period in 1980; on the other hand, during July through September 1981, slightly more arrived from the north. From October through

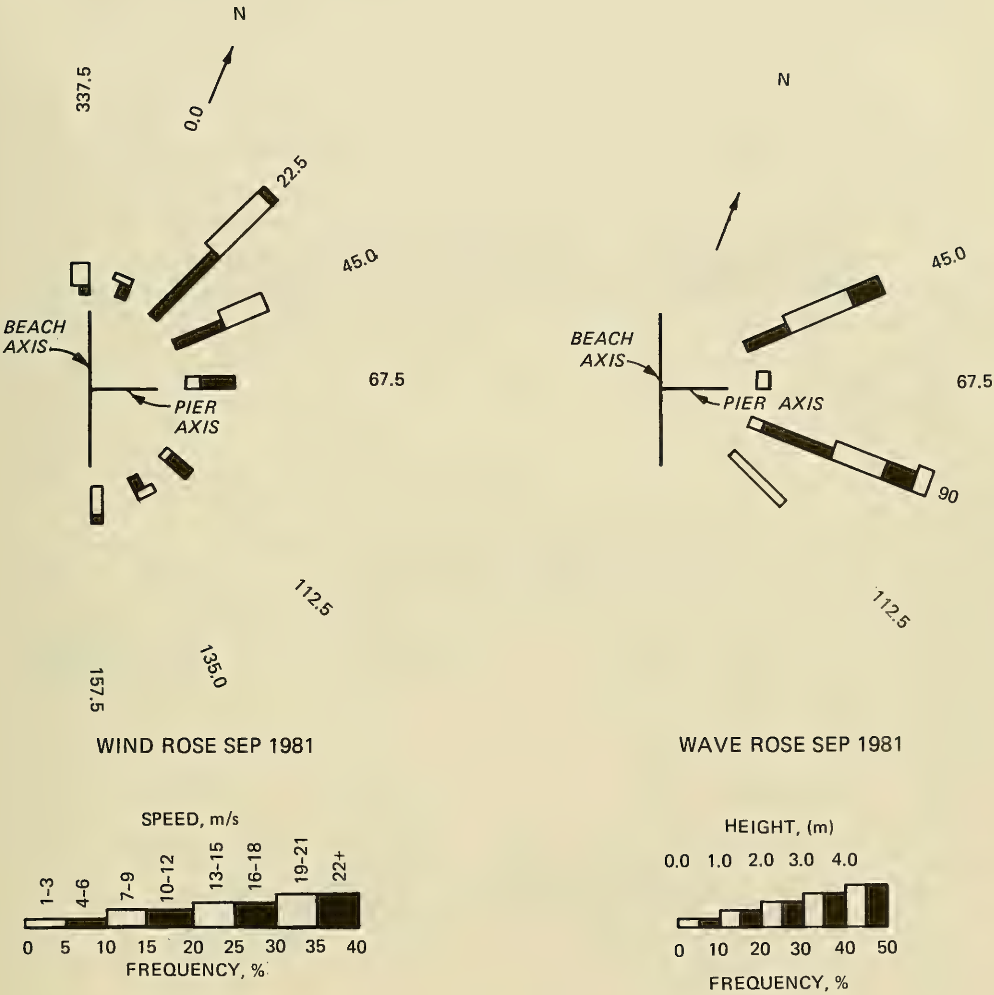


Figure 22. September 1981 wind and wave directional distributions

December, the resultant distribution between north and south was approximately the same for both years, but the angles relative to the pier during 1981 were more nearly shore normal.

Current Data

84. Surface current measurements were made daily at about 0700 EST by timing the movement of dye patches at three locations: (a) the seaward end of the FRF pier, (b) the midsurf zone position under the pier, and (c) along the beach 500 m updrift of the pier. Results of these measurements are given in Table 7 and Figures 23, 24, and 25. Since nearshore surface currents are highly dependent upon wind speed and direction and wave breaker angle, there is significant variability between the mean values for these locations, (Figure 26). At the seaward end of the pier, wind direction is more likely to control the prevailing longshore current direction; whereas in the surf zone, the breaker angle tends to dominate.

Table 7

1981 Monthly Mean Longshore Surface Current Speed and Direction

	Speed, cm/sec				
	Pier End		Pier Surf	Beach Updrift	
Month	1981	1978-1981	1981	1981	1980-1981
Jan	18	19	26	18	12
Feb	4	24	-9	-8	6
Mar	16	20	21	15	10
Apr	-1*	7	-2	-8	-1
May	15	13	7	-3	0
Jun	6	7	-13	-6	-13
Jul	6	4	-16	-10	-16
Aug	11	8	0	-7	-10
Sep	10	10	-10	-4	-9
Oct	24	12	25	21	24
Nov	20	16	22	13	20
Dec	16	11	23	13	14
Mean	12	12	6	3	3

* A minus sign indicates currents flowed northward.

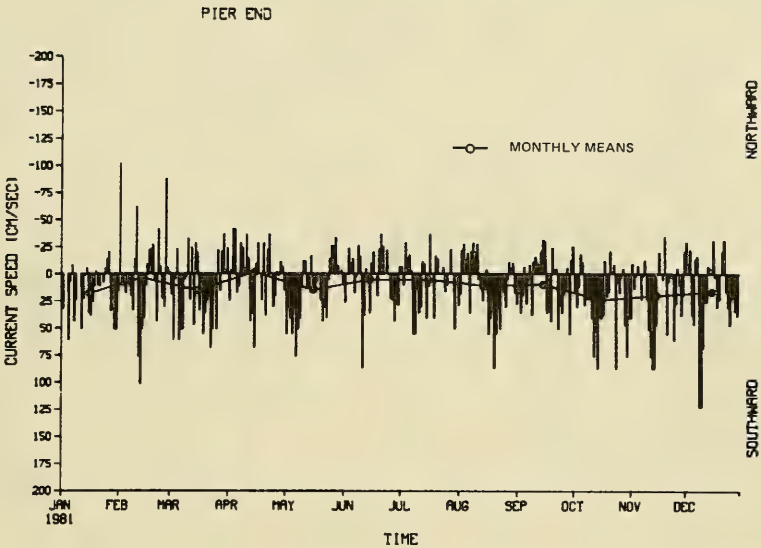


Figure 23. 1981 longshore surface current speed and direction at seaward end of FRF pier

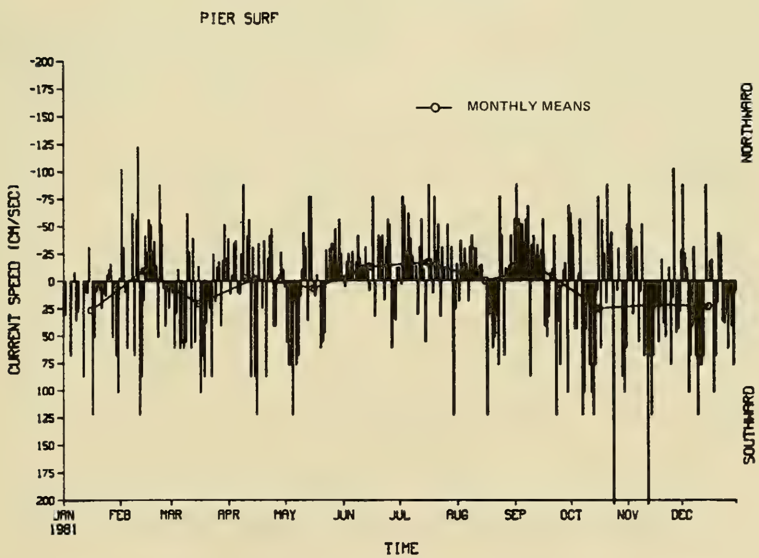


Figure 24. 1981 longshore surface current speed and direction at midsurf position under FRF pier

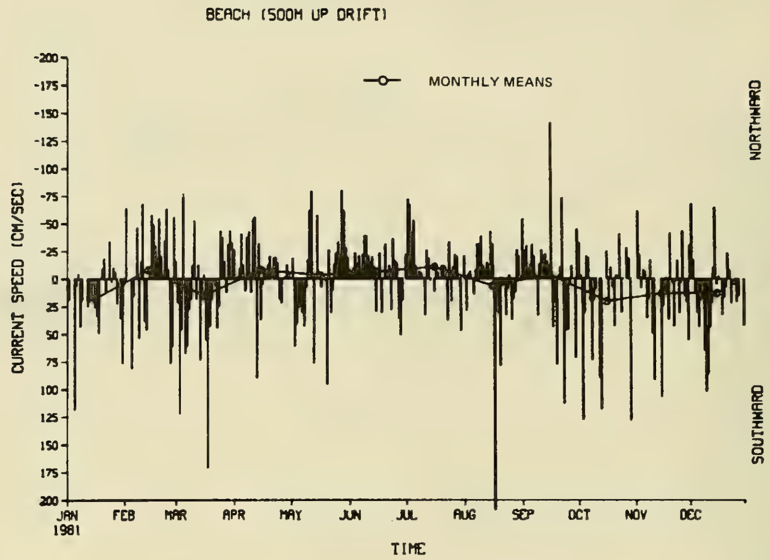


Figure 25. 1981 longshore surface current speed and direction 500 m updrift of FRF pier

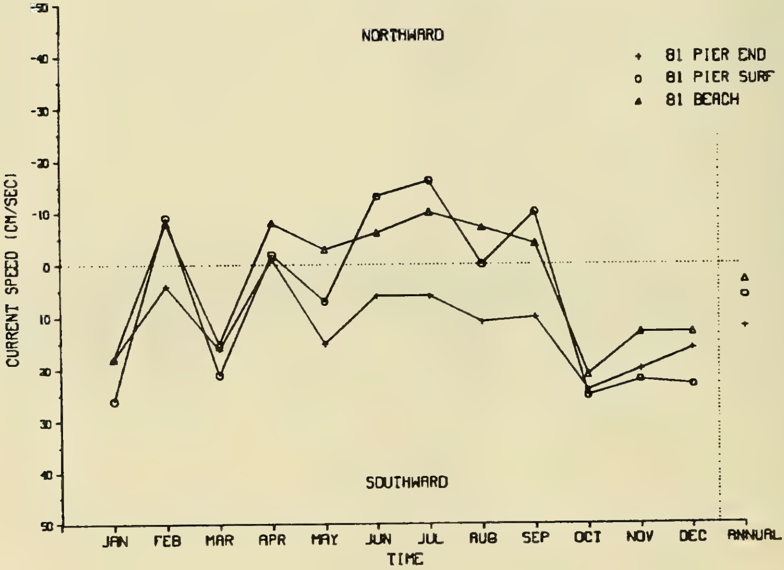


Figure 26. Monthly mean surface longshore current speed and direction at FRF for 1981

85. At the seaward end of the pier, the 1981 annual average current speed was 12 cm/sec southward, which agrees with the longer term average. Monthly means (Table 7 and Figure 26) show that strong southerly flows occurred during October and November 1981, which reflects the above-average incidence of northeasters during the period. This contrasts markedly with the 4-year average indicating maximum speeds in February and March. With the exception of April, all pier end mean monthly flows were to the south.

86. Both surf zone stations showed a general pattern of strong southward flow during the winter (Figure 26) and northerly flows during the summer when waves frequently approached from the south. February, however, was exceptional in the sense that currents were northward at both stations, with a southward minimum at the pier end.

87. The Mariner's Weather Log (NOAA/National Oceanographic Data Center 1981) states "the monthly mean sea-level pressure pattern was vastly different from climatology." High-pressure systems were unusually prevalent for February, off the east coast of the United States, accounting for the greater frequency of southerly winds.

88. Because of seasonally reversing longshore current patterns at surf zone locations, the annual resultant longshore current speeds were less in the surf than at the pier end; i.e., 6 cm/sec at the pier midsurf zone and only 3 cm/sec along the updrift beach. Other differences include an indication that individual current speeds were generally greater at the pier mid-surf zone than at the other two locations and that, occasionally, mean monthly currents in the surf zone were oppositely directed at the pier and the updrift beach.

89. On four occasions during 1981 (see tabulation below), the surface current speed exceeded 150 cm/sec. In each case, the currents were southwesterly directed and coincident with strong winds and high seas nearshore.

	Current			Wind		Wave*		Breaker Angle
Date	Speed cm/sec	Direction	Location	Speed m/s	Direction ref True North	Height m	Period sec	ref True North deg
18 Mar	171	Southward	Beach	8	50**	1.1	4.6	60
17 Aug	208	Southward	Beach	10	20	1.3	5.3	55
24 Oct	203	Southward	Pier midsurf	13	20	1.4	7.1	60
12 Nov	203	Southward	Pier midsurf	18	20	1.7	7.5	50

* Wave measurements taken from gage 615 at 100 m offshore.
** Note pier oriented at 70 deg ref True North.

Tide and Water Level Data

90. Tide height values and water levels due to predominantly astronomical forces of the Sun and Moon are discussed first in this section, followed by a discussion of the extreme water levels which were particularly influenced by meteorological conditions. All tide heights are referenced to the local NGVD of 1929, unless otherwise specified. Appendix D contains hourly water level data for storm dates during 1981. Monthly and annual tide statistics for 1981 are shown in Table 8, with previous years' means and extremes included at the bottom for comparison. Tides at the FRF are semidiurnal, and the mean tide range for 1981 was 101 cm. MSL, the average of all tide heights during the year, was +9 cm. MHW was +59 cm, and MLW was -42 cm. The mean tide statistics for 1981 were very nearly the same as those for previous years.

Table 8

1981 Monthly, 1979, 1980, and 1981 Annual, and 1979-1981 Cumulative Tidal Means and Extremes at Seaward End of FRF Pier, cm*

Monthly for 1981	MHW**	MTL	MSL	MLW	MR	EH	Date	EL	Date
Jan	48	-1	-1	-50	98	85	17	-81	20
Feb	44	-7	-7	-58	102	77	21	-89	6
Mar	56	5	5	-45	101	106	6	-73	15
Apr	43	-9	-9	-60	103	80	20	-110	5
May	64	12	13	-40	104	115	4	-66	4
Jun	60	8	8	-44	103	126	30	-68	4
Jul	60	9	10	-42	102	95	1	-77	29
Aug	69	19	19	-32	102	140	20	-69	16
Sep	72	22	22	-28	100	115	17	-64	15
Oct	66	17	16	-33	99	125	13	-63	21
Nov	67	18	19	-32	99	149	13	-65	9
Dec	55	6	6	-44	99	113	11	-81	17
Annual									
1981	59	8	9	-42	101	149	Nov	-110	Apr
1980	59	8	8	-43	102	118	Mar	-119	Mar
1979	60	9	9	-43	103	121	Feb	-95	Sep
Cumulative									
1979-1981	59	8	9	-43	102	149	Nov 81	-119	Mar 80

* All elevations refer to 1929 NGVD.

** Explanation of abbreviations: MHW = mean high water; MTL = mean tide level; MSL = mean sea level; MLW = mean low water; MR = mean range; EH = extreme high water; and EL = extreme low water.

91. Mean and extreme monthly tide levels (Figure 27) show a 5- to 6-month periodicity; this phenomenon is due in part to the inclination of the Sun, a long-period astronomical tide constituent which has a periodicity of approximately 6 months. Additionally, astronomical forces with annual periodicity and the seasonal oscillation of the specific volume of sea water as a function of temperature, called the Steric effect, may explain the observed periodicity in the data (Pattullo et al. 1955). Strong offshore winds during most of April 1981 may in part explain its anomolously low water level statistics.

92. Although the annual statistics were nearly the same, hourly, daily high, and daily low tide height distributions for 1981 versus 1980 (Figure 28) reveal that during 1981 the high tides which occur infrequently--e.g., less than 2 percent of the time--were higher than those of the previous year. These extreme water levels were associated with meteorological events which coincided with spring tides. For comparison, during 1979 and 1980, 1 percent of the hourly tide heights exceeded 80 cm, while in 1981, 1 percent exceeded 90 cm. On four occasions during 1981, the water level exceeded the highest water level previously recorded since 1979. The numerous extreme water levels during the year, with the associated wave conditions and coincident tidal stages, are tabulated below:

Date	Extreme High Water Level, cm	Wave Height, m	Comments
4 May	115	2.7	Monthly spring tide
30 Jun	126	1.8	Monthly spring tide
20 Aug	140	3.1	Tropical Storm Dennis
13 Oct	125	2.6	Perigean spring tide
13 Nov	149	3.5	Perigean spring tide coincident with severe northeaster storm
11 Dec	113	1.0	Proxigean* spring tide

* Explained below.

93. Wood (1978) discusses perigee-syzygy and the occurrence of coastal flooding (when coincident with strong and persistent onshore winds) associated with the reduced lunar distances and solar-lunar alignment during perigean spring tides. Wood attributes the high water levels to the reinforcing effect that the alignment of the Sun's and Moon's gravitational forces have on the

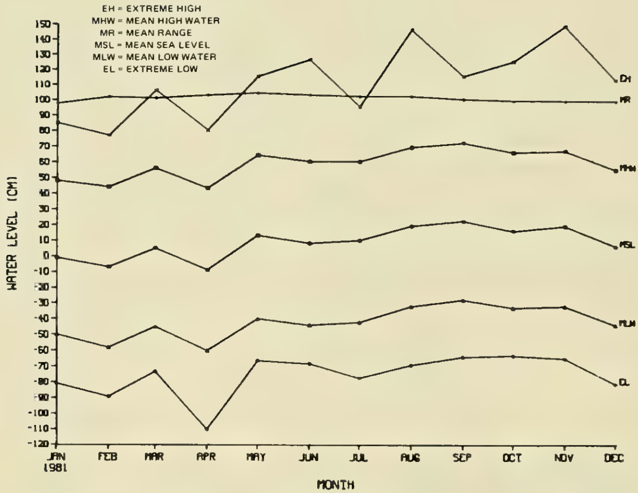


Figure 27. 1981 monthly tidal means and extremes at seaward end of FRF pier

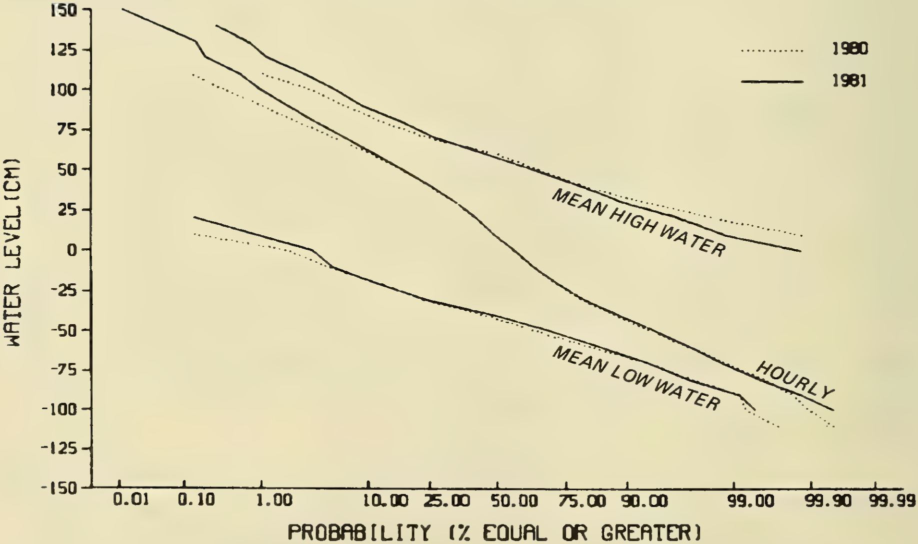


Figure 28. 1981 and 1980 tide height distributions

Earth and gives many examples of the effects of this phenomenon on coastal areas. Perigee-syzygy alignment, Wood states, can cause tidal flooding within a period of 1 to 3 days following (or in some few cases, a day or so preceding) the mean phase or epoch of the perigee-syzygy alignment. Approximately every 1 to 1-1/2 years, the Moon's orbit carries it exceptionally close to the Earth (Wood named this "proxigee"), creating especially amplified tides. The above tabulation identifies three occurrences during October through December 1981 of these strong astronomical forces, each coincident with large waves at the FRF.

94. In November, the perigean spring tide and a subtropical storm (northeaster) produced severe beach erosion, resulting in the destruction of a number of houses in the vicinity of the FRF. The water level rose to 149 cm, the highest water level recorded to date at the FRF.

Water Characteristics

Water temperature

95. Daily sea surface water temperatures at the seaward end of the FRF pier are presented in Figure 29. In 1981, as in 1980, large day-to-day temperature differences occurred in June, July, and August when frequent offshore winds blew warm surface water offshore, allowing upward and landward circulation of the much colder bottom water. Onshore winds reverse this circulation, piling up warm surface water against the shoreline, with a resulting seaward flow along the bottom.

96. The monthly mean sea surface temperatures for 1981 and 1980 presented in Figure 30 and seasonal distributions of temperatures for 1981 and 1980 data, combined in Figure 31, show the seasonal variability typical of this location. However, the winter minimum monthly mean was about 4 deg colder in 1981 than in 1980, and the July mean was about 4 deg warmer than in 1980. Overall, the 1981 annual mean was slightly warmer than the 1980 mean (Table 9).

Sea surface water visibility

97. Visibility in coastal nearshore waters depends on the amount of salts, soluble organic material, detritus, living organisms, and inorganic particles in the water. These dissolved and suspended materials change the absorption and attenuation characteristics of the water, which thus vary daily and throughout the year.

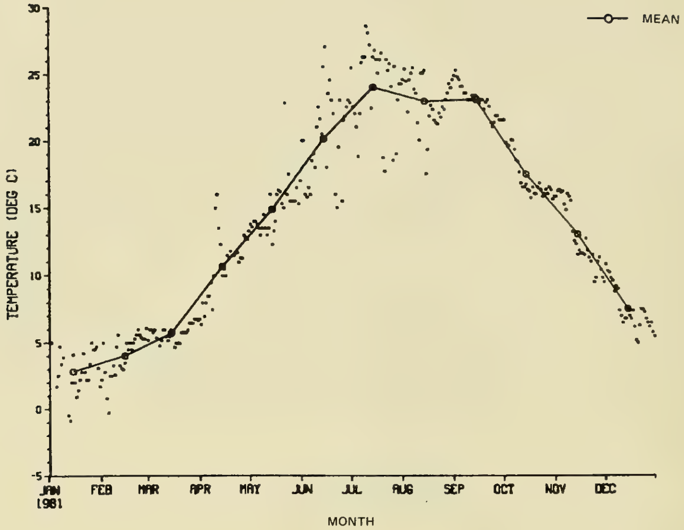


Figure 29. 1981 daily sea surface temperatures at seaward end of FRF pier

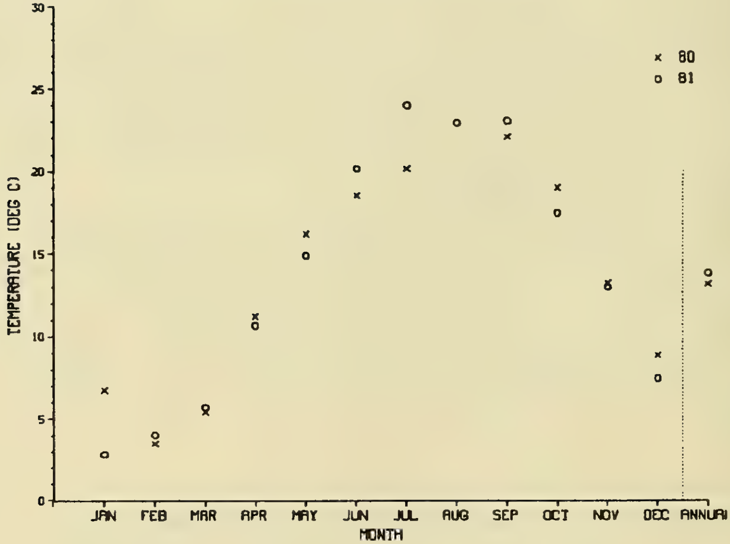


Figure 30. 1981 and 1980 monthly and annual mean sea surface temperatures

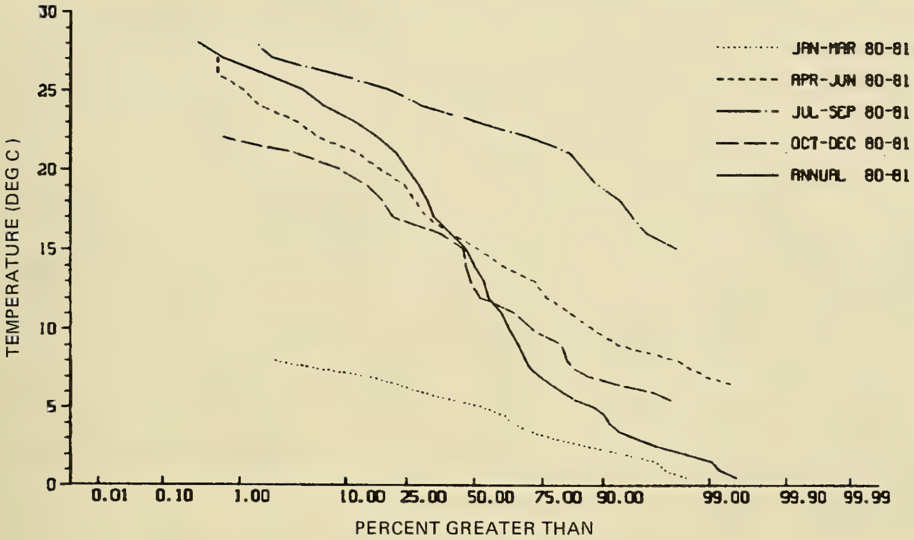


Figure 31. 1981 plus 1980 seasonal sea surface temperature distributions

Table 9

Monthly Mean Sea Surface Water Characteristics

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
					Mean Sea Surface Water Temperature, °C								
1981	2.8	4.0	5.7	10.4	14.9	20.1	24.0	22.9	24.0	17.5	13.0	7.5	13.9
1980	6.8	3.5	5.5	11.2	16.2	18.5	20.1		22.1	19.0	13.2	8.9	13.2
Overall	4.8	3.8	5.6	10.8	15.6	19.3	22.0	22.9	23.0	18.3	13.1	8.2	13.6
					Mean Sea Surface Water Visibility, m								
1981	1.4	1.7	1.1	1.7	1.5	3.0	1.9	1.3	1.2	1.0	0.8	0.9	1.6
1980	1.3	1.4	1.0	2.5	2.7	3.9	4.6	3.4	2.9	1.4	1.0	0.9	2.3
Overall	1.4	1.6	1.1	2.1	2.1	3.5	3.3	2.4	2.1	1.2	0.9	0.9	2.0
					Mean Sea Surface Water Density, g/cm^3								
1981	1.0252	1.0250	1.0254	1.0264	1.0243	1.0231	1.0215	1.0220	1.0225	1.0235	1.0241	1.0250	1.0240

98. Daily water visibility values, measured at the seaward end of the pier are shown in Figure 32. In 1981, as in 1980, largest day-to-day visibility differences occurred during the summer months, since the pattern of offshore and onshore winds that produced major temperature differences also controlled the visibility. The warm surface water is usually quite clear, while the cooler bottom water contains large concentrations of suspended matter.

99. Figure 33, the distribution of surface water visibility for 1981 and 1980, shows that the 1981 values were much lower than those for 1980. 1981 and 1980 data combined indicated that 50 percent of the time the visibility was greater than 1 m and that 10 percent of the time visibility exceeded 3.5 m. Table 9 gives a summary of the water visibility data. Monthly mean visibility values for 1981 (Figure 34) and the seasonal distribution of visibility for the combined 1980 and 1981 data (Figure 35) show the seasonal variability typical at the FRF: higher values in the summer than during the remainder of the year.

Surface water density

100. Although there was considerable scatter in 1981 surface water density values (Figure 36), monthly mean values generally show an inverse dependence on water temperature (Figures 37 and 30). This pattern may be affected by rainfall; however, large amounts of rain occurred in July and August when density values were at a minimum (Figure 38 and Table 9). No density data were collected during 1980.

Survey Data

101. Waves and currents interacting with the beach and nearshore cause increases and decreases in the amount of sediment as a result of longshore transport, movement of the bar(s) on- or offshore, and the exchange of sediment between the beach and nearshore bottom. These changes can occur very rapidly, in response to a storm, or slowly as a result of seasonal variations in wave and current conditions.

102. In this section, time histories of bottom elevations at selected locations along the pier and contour diagrams of the bathymetry from the dune to 1,000 m offshore for a 1,000-m distance along the beach (centered at the pier) are presented.

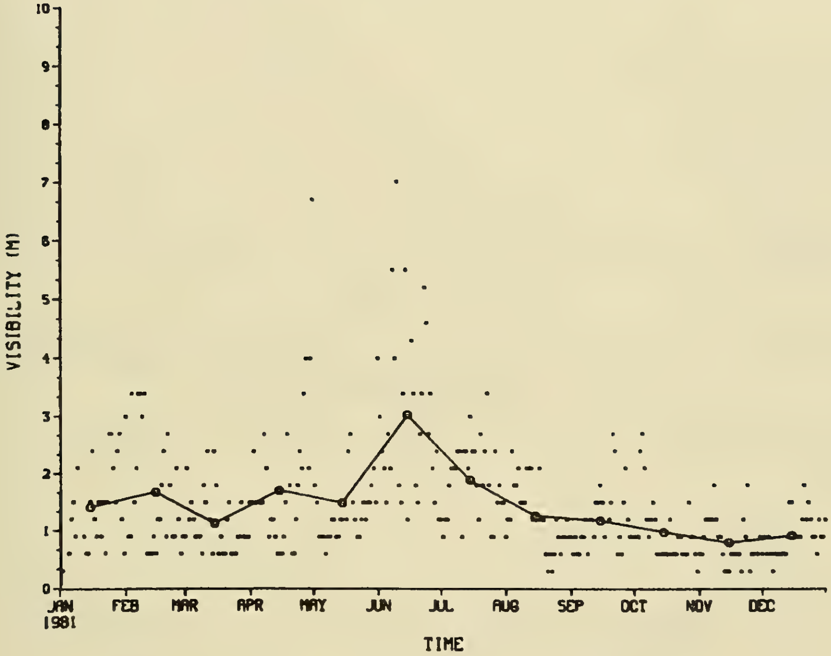


Figure 32. 1981 daily sea surface visibility at seaward end of FRF pier

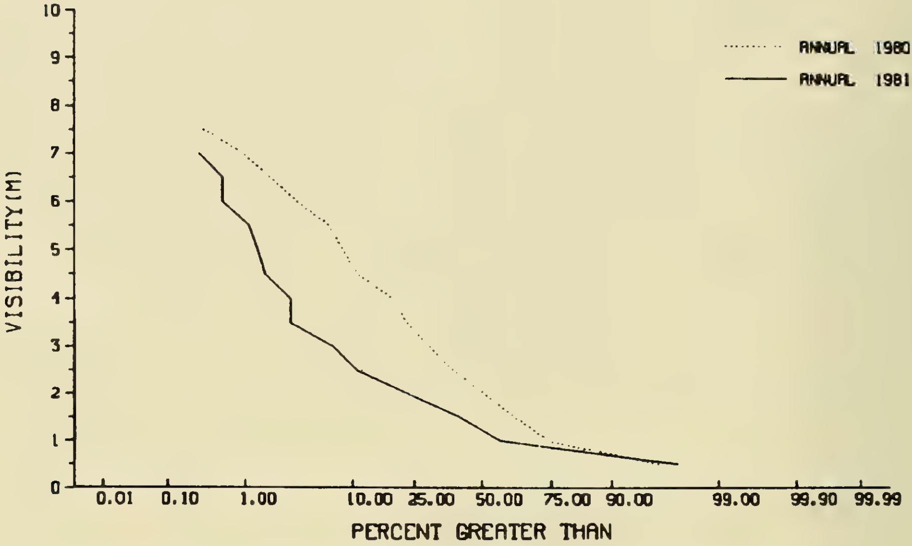


Figure 33. 1981 and 1980 sea surface visibility distributions

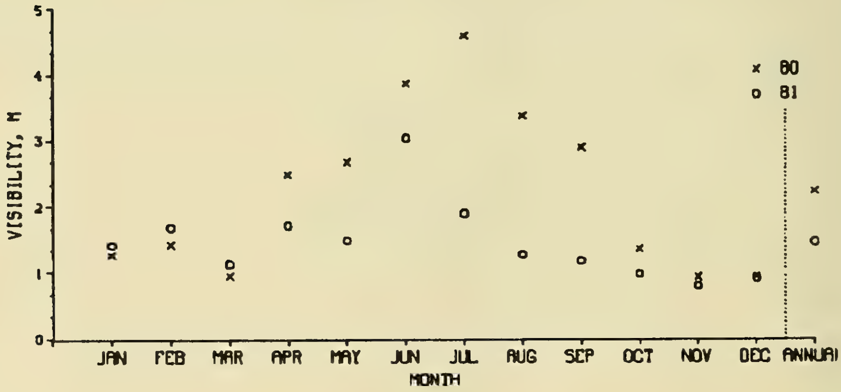


Figure 34. 1981 and 1980 monthly and annual mean sea surface visibility

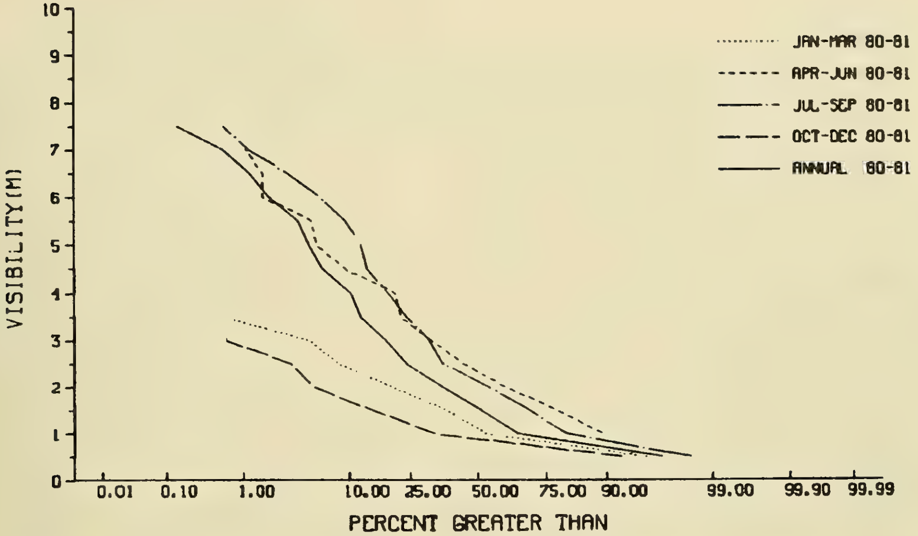


Figure 35. 1981 plus 1980 seasonal sea surface visibility distribution

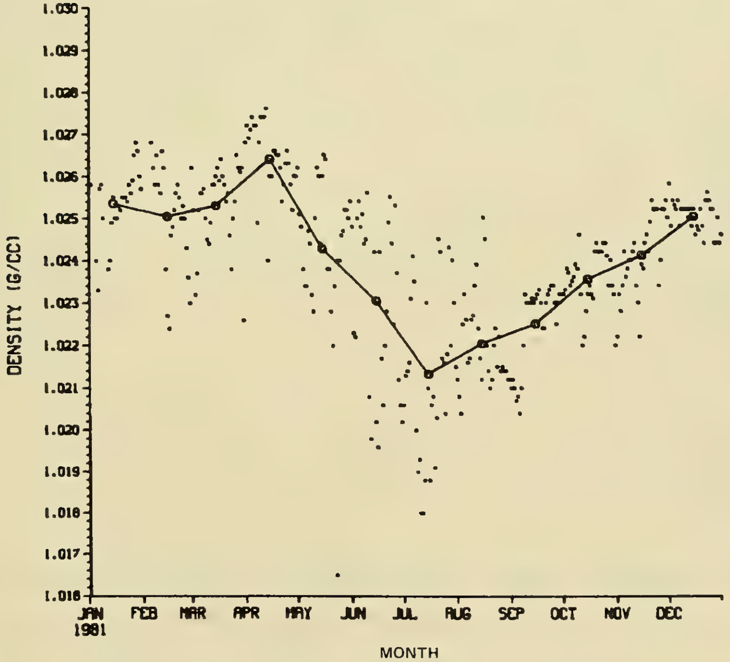


Figure 36. 1981 daily sea surface densities

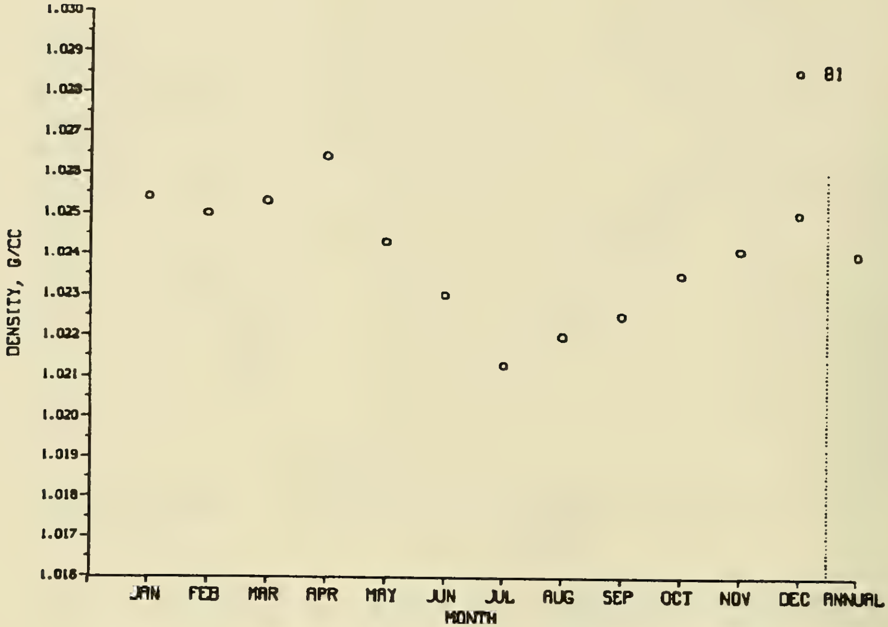


Figure 37. 1981 monthly and annual mean sea surface densities

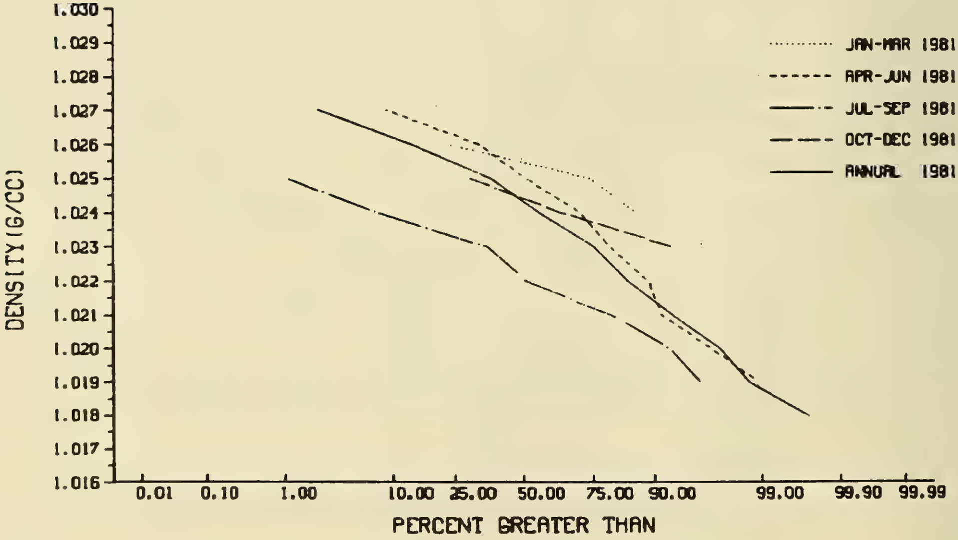


Figure 38. 1981 seasonal and annual distribution of surface water density

History of bottom elevation

103. A history of the bottom elevations taken at the Baylor wave gage, pier end tide gage, and selected other locations along the pier is useful for interpretation of data. Variations of elevation under the pier are due to natural beach processes (such as profile changes due to bar movement), as well as to scour due to the interaction of the pier piles with waves and currents. Figure 39 shows the maximum vertical variation for 1981 as a function of depth. The most active areas were landward of 400 m due to a very mobile nearshore bar. Variations in the scour hole at the seaward end of the pier approached 2 m.

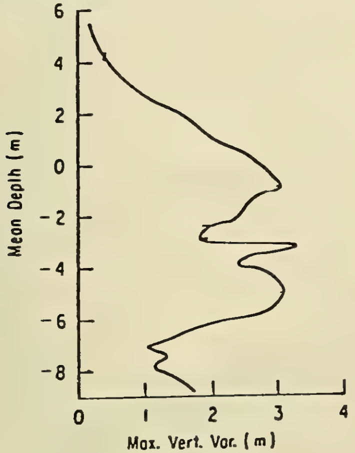


Figure 39. 1981 Maximum vertical variation of ocean bottom under FRF pier

Bathymetry

104. Beginning in July and at approximately monthly intervals thereafter, the bathymetry adjacent to the FRF pier was surveyed. Contour diagrams based on the data for each survey are contained in Appendix C.

105. The scour resulting from the interaction of the pier with waves and currents produced a long, shallow trough under the pier (Figure 40). The trough, generally 100 to 200 m wide and extending slightly past the seaward end of the pier, changed depth, width, and symmetry in response to changing wave conditions.

106. Just inshore of the seaward end of the pier, the trough deepened into a large scour hole (Figure 41). During storms such as that on 13-16 November, this hole tended to deepen and expand in a downdrift direction (Figure 42). A more detailed description of the interaction of the pier with waves and currents and the effect on the bottom can be found in Miller, Birkemeier, and Dewall (1983).

107. The largest changes in the bathymetry during 1981 occurred during the November storm, when a large quantity of sediment moved from the north side to the south side of the pier (Figure 43). In general, the response of the

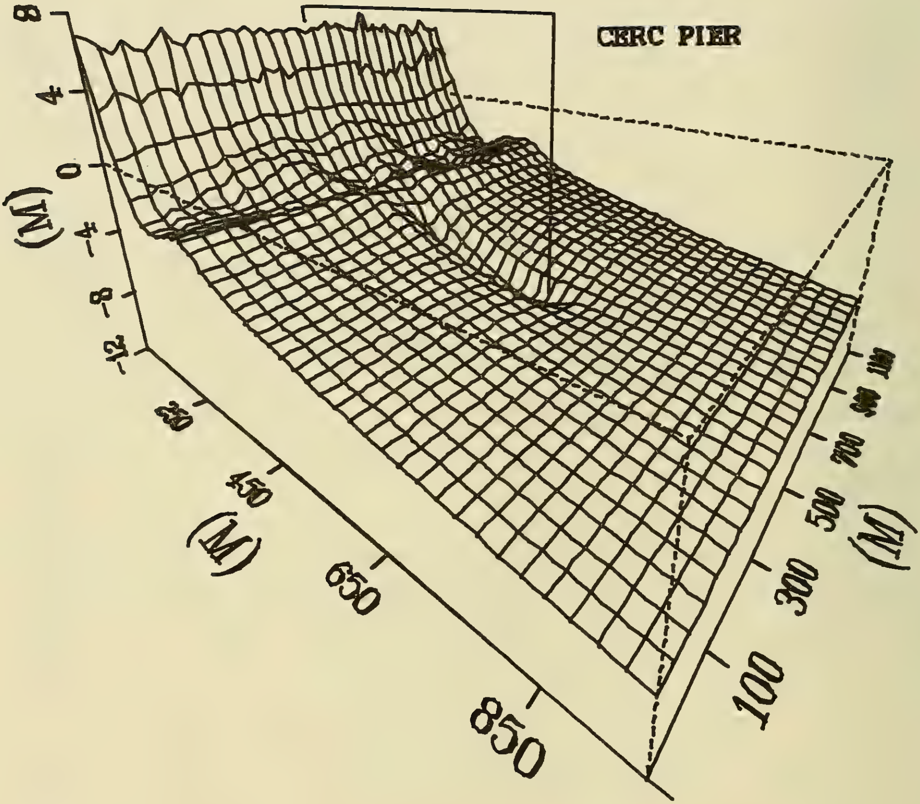


Figure 40. Three-dimensional plot of FRF bathymetry, 3 November 1981

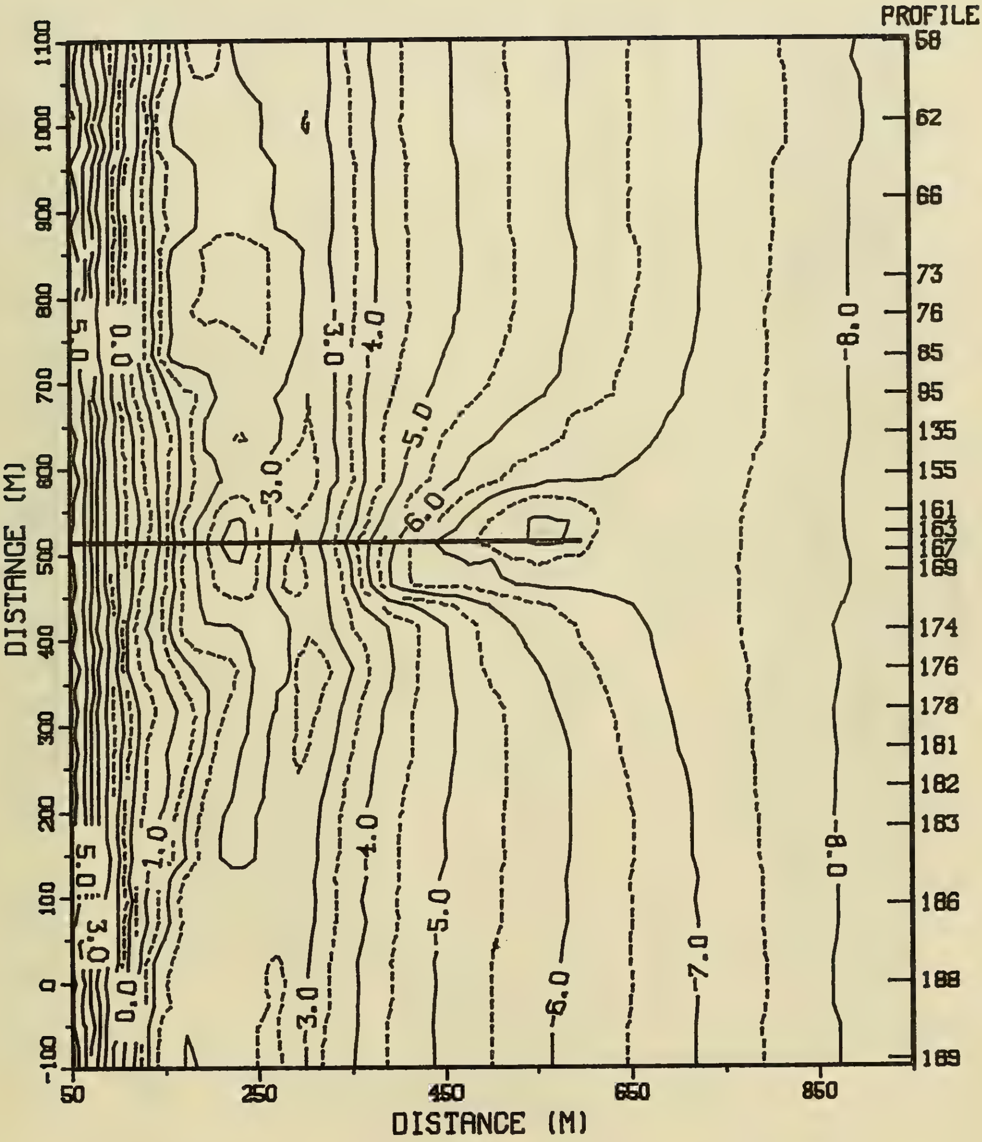


Figure 41. Contour diagram of FRF bathymetry, 3 November 1981 (contours in meters)

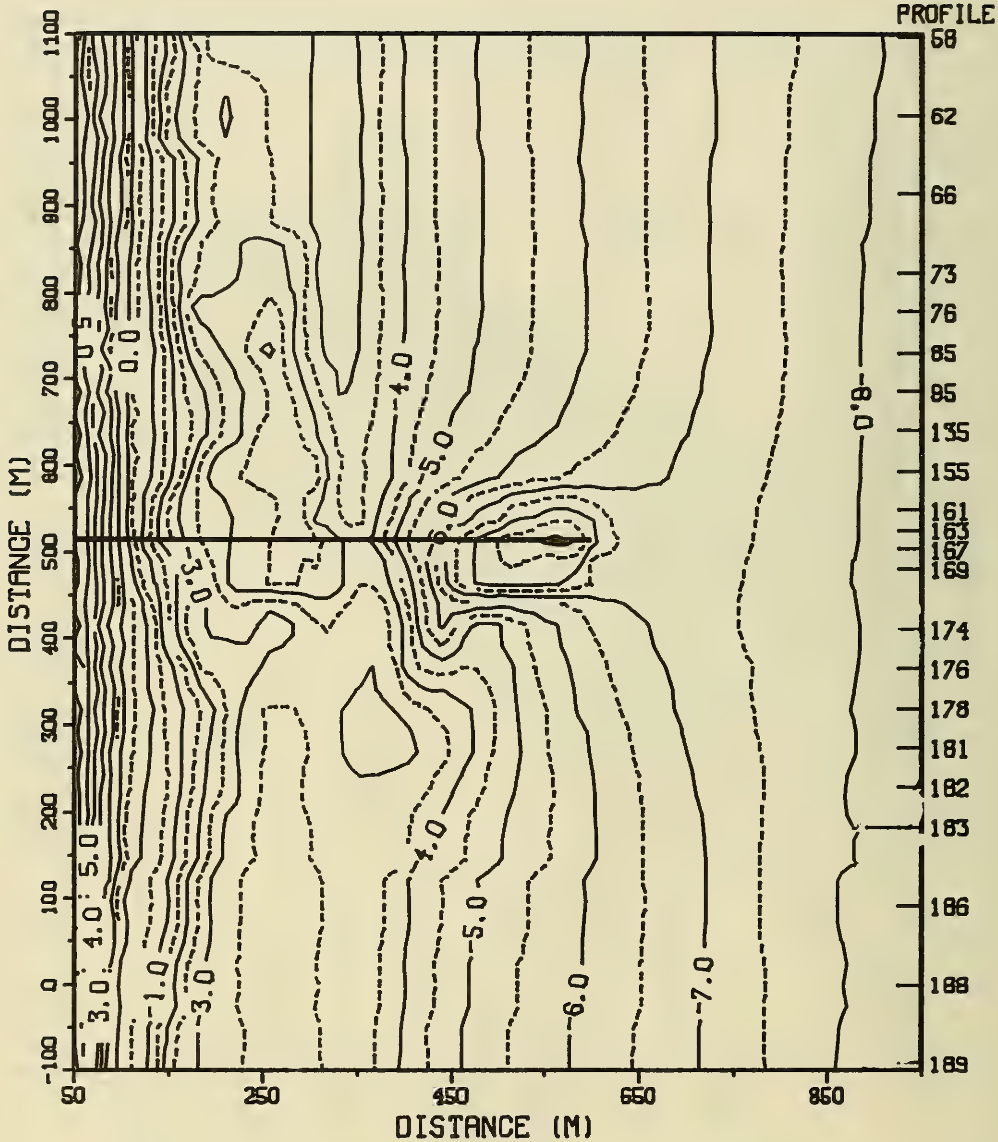


Figure 42. Contour diagram of FRF bathymetry, 16 November 1981 (contours in meters)

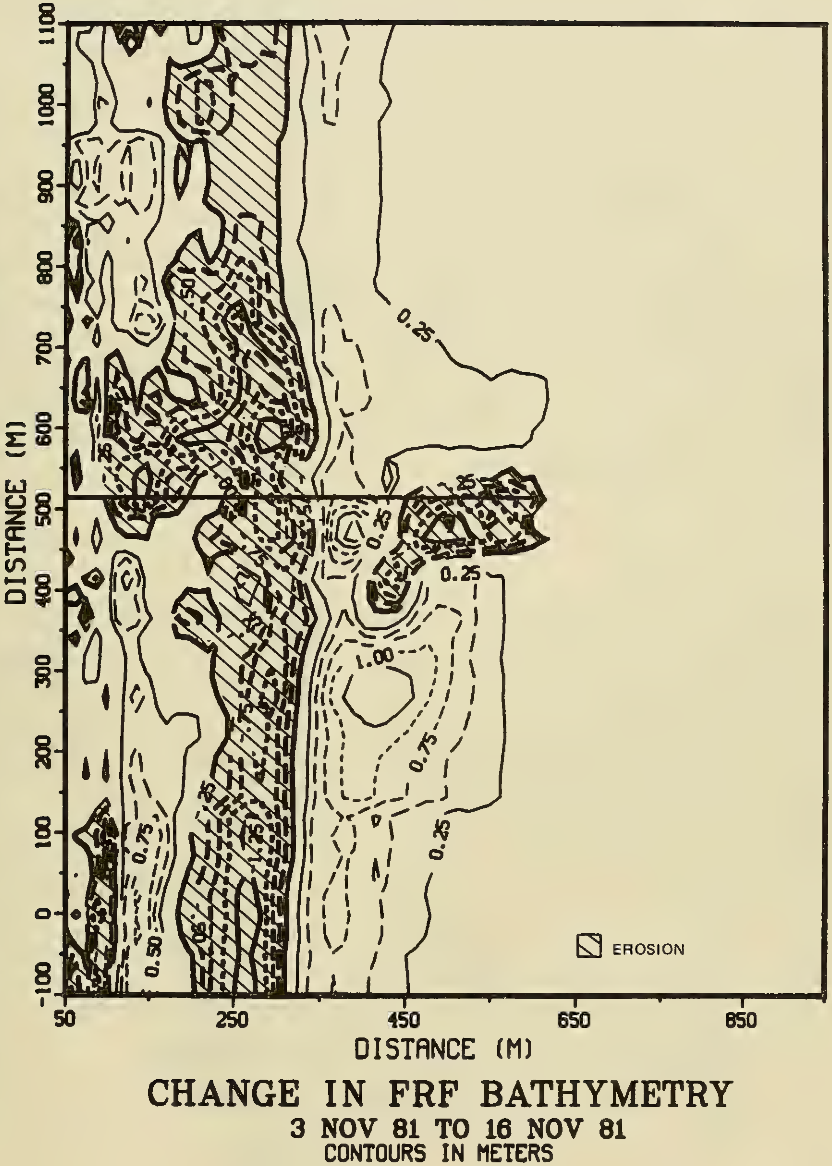


Figure 43. Contour diagram of bathymetric changes, 3-16 November 1981 (contours in meters)

bottom to 3 days of waves from the northeast with H_{m_o} in excess of 3 m was a 75-m seaward movement of the nearshore bar. At the pier, the scour hole deepened to -9.8 m, its greatest depth since the pier was constructed.

Sediment Data

108. A summary of the 15 October sediment survey at the FRF is presented in Figure 44 and Table 10; sediment size distribution across one profile as a function of distance from a reference baseline is provided. Between the beach face and the nearshore trough (110 to 160 m from the baseline), sand sizes were coarse and poorly sorted, with standard deviations greater than 1.1 phi. On the dune and seaward of the nearshore trough (>160 m), sizes were better sorted and finer, although a clearly bimodal distribution occurred on the bar crest and seaward flank locations (i.e., 216 and 254 m from the baseline).

Photography

109. Two sets of photographic data were used to document nearshore and beach conditions in the vicinity of the FRF in 1981. Daily 35mm transparencies were taken of the beach from the pier looking both north and south (see sample in Figure 45). Aerial photographic missions were also flown on the flight lines and dates indicated in Table 11, usually at a scale of 1:12,000. Figure 46 is a sample of this imagery obtained on 24 March 1981.

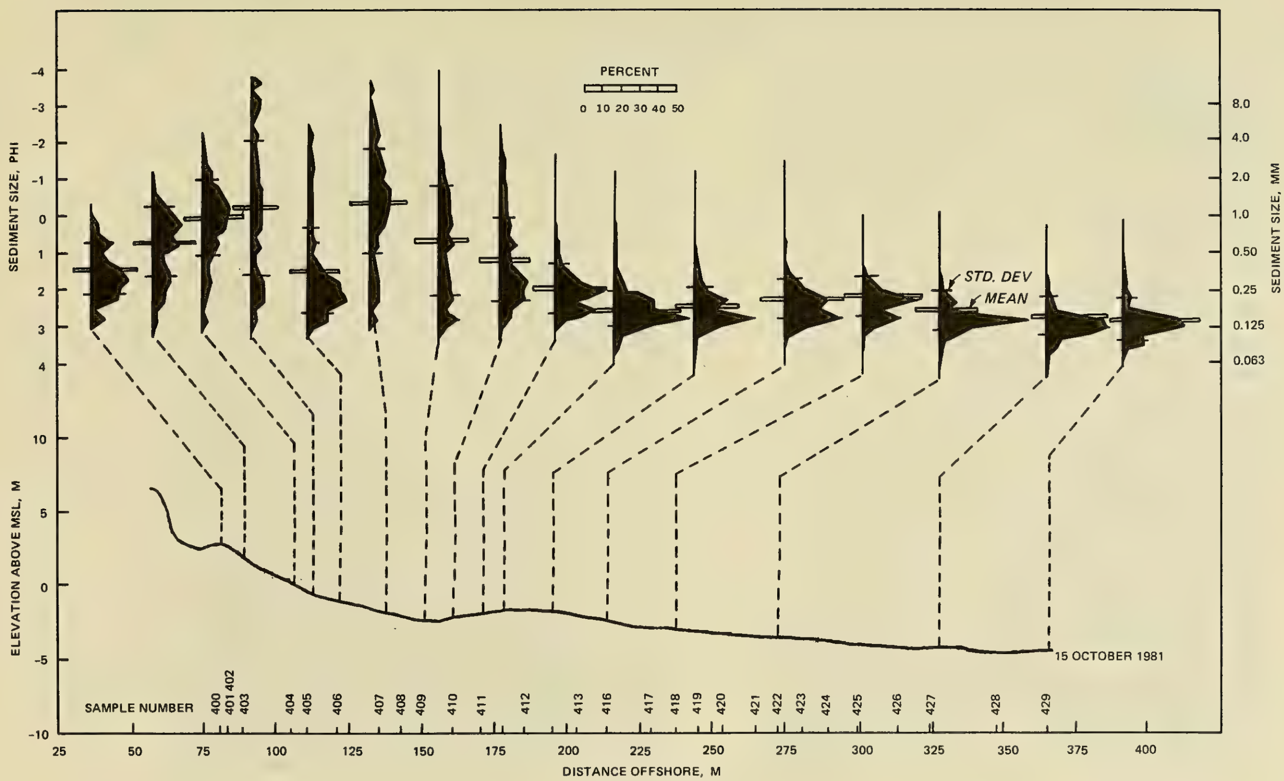


Figure 44. Distribution of sediments along profile 188 (500 m south of pier), 15 October 1981

Table 10

Sediment Distribution Summary for Profile 188

15 October 1981

Sample Number	Distance from Baseline, m	Elevation, m	Mean Size mm	Mean Size phi	Standard Deviation, phi
400	82.3	+2.9	0.36	1.47	0.71
401	86.7	+2.5	0.43	1.21	0.88
402	86.5	+1.9	0.51	0.97	0.84
403	94.5	+1.1	0.64	0.64	0.92
404	105.1	+0.4	0.96	0.06	1.03
405	111.8	-0.6	1.25	-0.32	1.86
406	121.3	-1.1	0.37	1.44	1.22
407	134.3	-2.6	1.33	-0.41	1.46
408	142.2	-2.9	1.00	0.00	1.51
409	149.9	-3.2	0.65	0.62	1.49
410	160.7	-3.1	0.47	1.10	1.17
411	169.1	-2.8	0.25	1.97	0.69
412	185.9	-2.5	0.19	2.43	0.53
413	206.8	-2.3	0.17	2.58	0.52
414	177.0	-2.5	0.18	2.45	0.43
415	195.1	-2.4	0.19	2.41	0.46
416	216.5	-2.2	0.21	2.27	0.55
417	228.9	-2.1	0.23	2.12	0.56
418	236.6	-2.3	0.22	2.17	0.52
419	245.9	-2.6	0.20	2.30	0.57
420	254.5	-2.7	0.22	2.21	0.59
421	265.3	-2.3	0.19	2.37	0.65
422	273.6	-2.6	0.17	2.53	0.56
423	282.0	-3.4	0.17	2.53	0.52
424	290.3	-3.5	0.16	2.60	0.52
425	300.1	-3.6	0.17	2.60	0.54
426	313.4	-3.8	0.16	2.63	0.52
427	326.7	-3.9	0.15	2.70	0.52
428	343.8	-4.1	0.15	2.75	0.53
429	365.9	-4.3	0.15	2.75	0.58

a. Looking north from the pier deck

b. Looking south from the pier deck

Figure 45. 4 November 1981 beach photographs

Table 11

1981 Aerial Photography Inventory

Date	Location	Type
24 Mar	10 miles north of FRF to 10 miles south (scale 1:12,000)	Color
27 Aug	Cape Hatteras to Cape Henry (scale 1:12,000)	B/W
24 Sep	2 miles north of FRF to 2 miles south (scale 1:12,000)	Color
	Currituck Sound to Atlantic Ocean (scale 1:12,000)	B/W
24 Nov	2 miles north of FRF to 2 miles south (scale 1:6,000)	B/W
	Currituck Sound to Atlantic Ocean (scale 1:12,000)	B/W

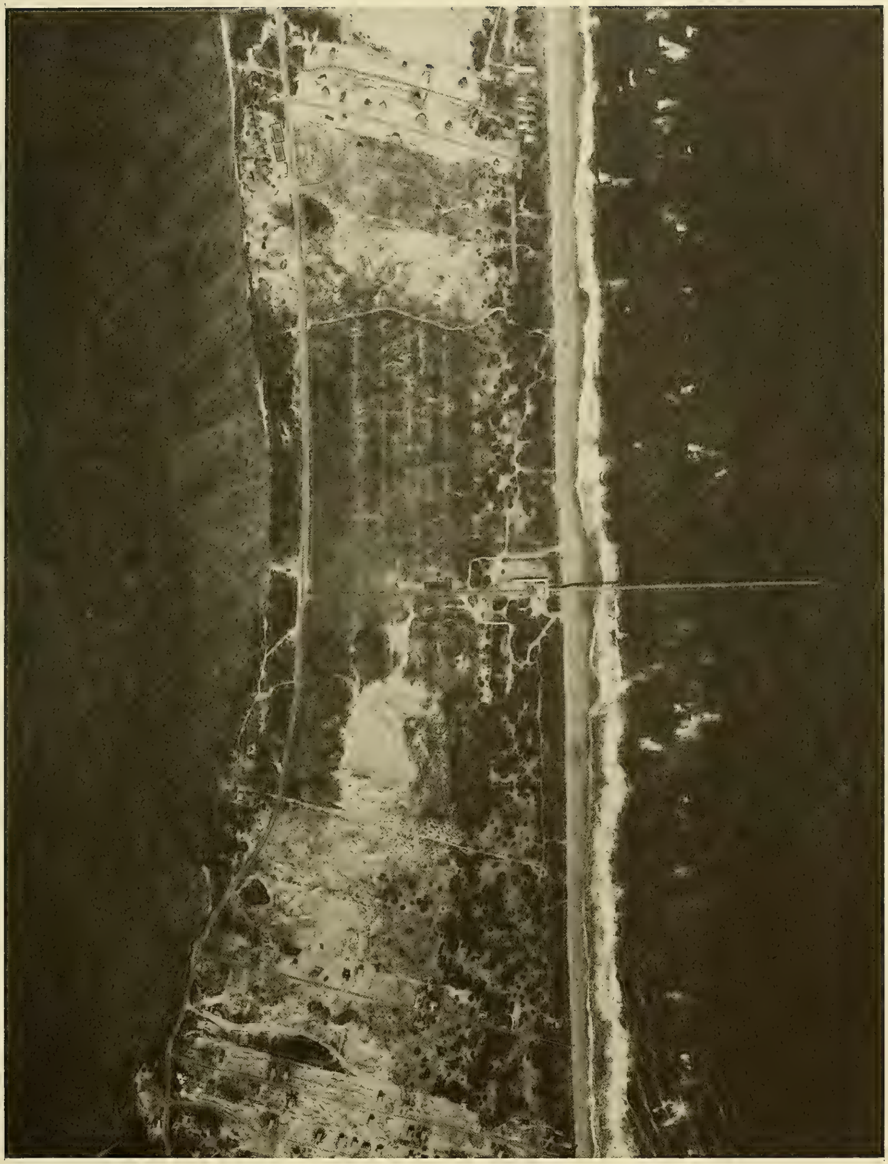


Figure 46. Sample aerial photograph of FRF taken 24 March 1981

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APPENDIX A: WAVERIDER BUOY MAINTENANCE AND CALIBRATION INFORMATION

1. This appendix presents the maintenance and calibration required for the Waverider buoy gages.

2. Datawell recommends the Waverider buoys be cleaned and new batteries installed at least once every 9 months. The buoys were replaced on a number of occasions during the year, as listed in the gage histories in Appendix B. Considerable biological growth occurs during the summer months when the water temperature is above 10° C. Antifoulant paint and at least one cleaning and painting during the summer reduce the fouling problem.

3. The buoys were calibrated at the National Oceanic and Atmospheric Administration (NOAA) Engineering Support Office, Ocean Wave Instrument Facility (Ribe 1981).* Ribe presents the following three correction factors for use to increase wave measurement accuracy: (a) the Datawell-predicted decrease in electronic sensitivity as a function of oscillation period, (b) a difference error based on deviations from (a) found during NOAA's calibrations, and (c) a temperature-dependent adjustment of the sensitivity due to an unknown chemical reaction in the conducting fluid surrounding the Waverider accelerometer. These three corrections and their applications are discussed below.

Datawell-predicted Decrease in Sensitivity (DW)

4. Waverider buoy sensitivity /A/ for the buoy electronics decreases with increasing period T of sinusoidal vertical motion according to Datawell as follows:

$$/A/ = \frac{1}{\left[1 + \left(\frac{T}{To}\right)^4\right]^{1/2}} \tag{1}$$

where To = 30.8 sec is a characteristic period provided by Datawell. This sensitivity decrease results in amplitude errors of less than 3 percent for oscillation (wave) periods less than 15 sec. Figures A1 through A4 present

* References cited in this appendix are included in the References at the end of the main text.

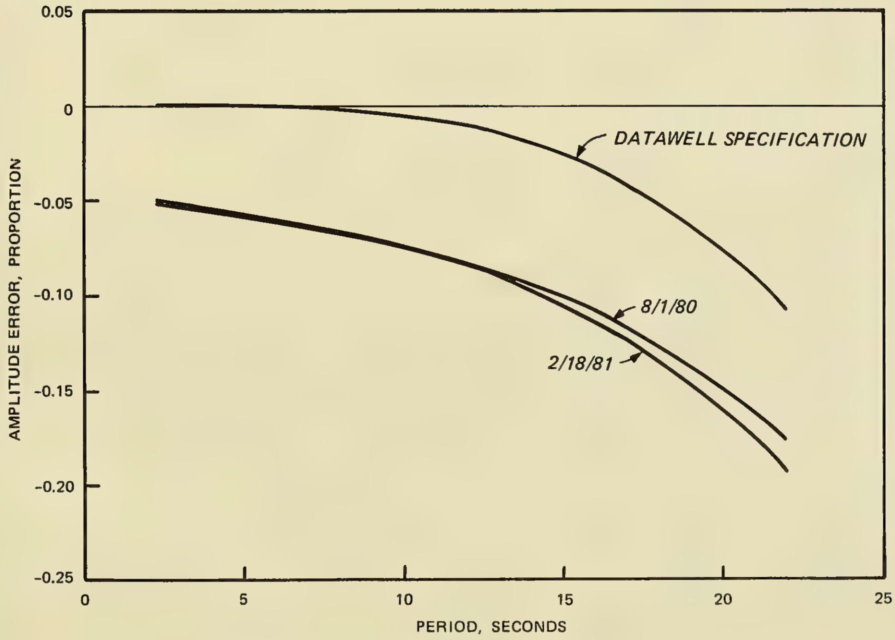


Figure A1. Waverider 66967 calibrations, NOAA Engineering Support Office (After Ribe 1981)

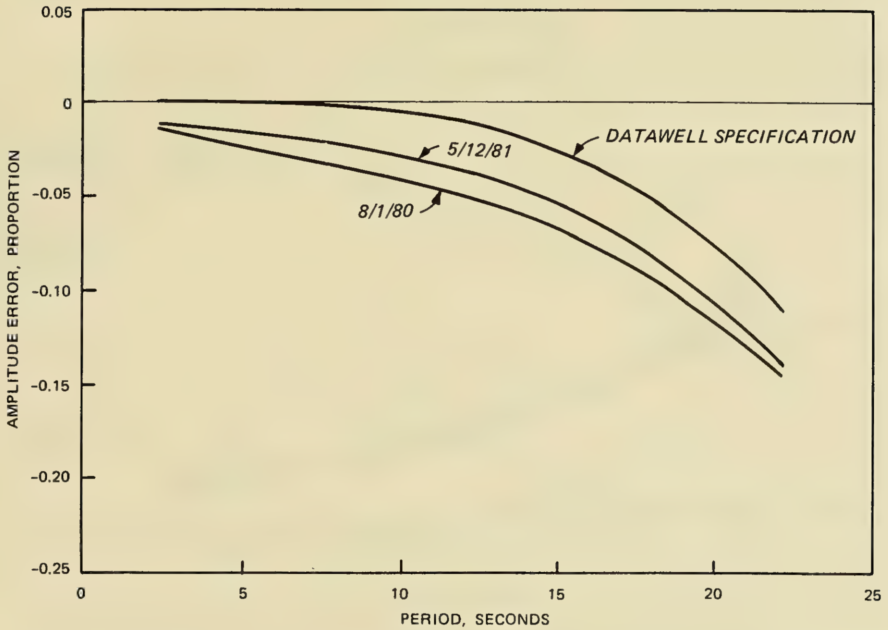


Figure A2. Waverider 66968 calibrations, NOAA Engineering Support Office (After Ribe 1981)

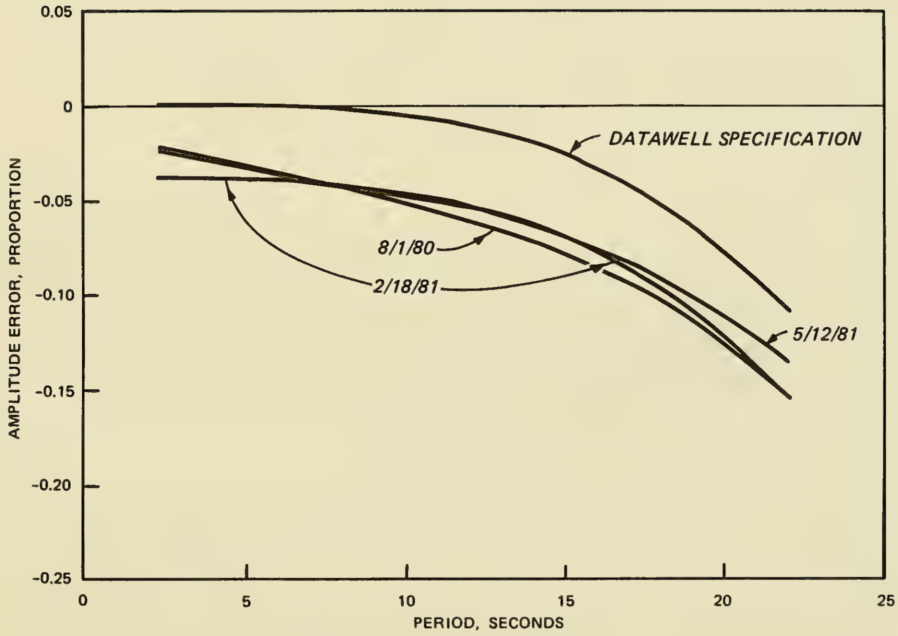


Figure A3. Waverider 66969 calibrations, NOAA Engineering Support Office (After Ribe 1981)

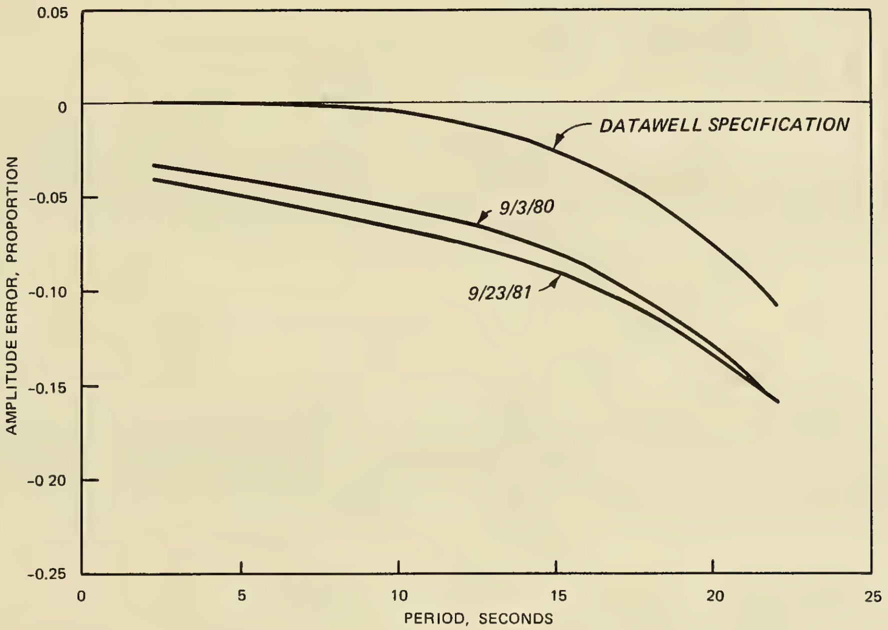


Figure A4. Waverider 66977 calibrations NOAA, Engineering Support Office (After Ribe 1981)

curves for (DW) = /A/ - 1 , the Datawell-predicted sensitivity decrease error; the actual sensitivity does not decrease with period according to the Datawell relationship given in Equation 1.

Difference Error (d)

5. Ribe (1981) presents tables of the difference error based on a least-mean-squares-order polynomial in period T for a "best-estimate" difference error d between the Datawell-predicted decrease in sensitivity and that found from the actual buoy calibrations.

6. In Tables A1 through A9, DW (Datawell difference) and d are tabulated as functions of T for each buoy. Best accuracy is obtained by choosing the calibration values nearest in time to the date of the measurements.

Table A1

Waverider 66967 Calibration 8/1/80

Period, sec	Frequency, Hz	Difference	Datawell
2.0000	0.50000	-0.0484	-0.0000
2.0317	0.49219	-0.0485	-0.0000
2.0645	0.48438	-0.0487	-0.0000
2.0984	0.47656	-0.0488	-0.0000
2.1333	0.46875	-0.0489	-0.0000
2.1695	0.46094	-0.0491	-0.0000
2.2069	0.45313	-0.0492	-0.0000
2.2456	0.44531	-0.0494	-0.0000
2.2857	0.43750	-0.0495	-0.0000
2.3273	0.42969	-0.0497	-0.0000
2.3704	0.42188	-0.0499	-0.0000
2.4151	0.41406	-0.0500	-0.0000
2.4615	0.40625	-0.0502	-0.0000
2.5098	0.39844	-0.0504	-0.0000
2.5600	0.39063	-0.0506	-0.0000
2.6122	0.38281	-0.0508	-0.0000
2.6667	0.37500	-0.0510	-0.0000
2.7234	0.36719	-0.0512	-0.0000
2.7826	0.35938	-0.0514	-0.0000
2.8444	0.35156	-0.0517	-0.0000

(Continued)

Table A1 (Concluded)

Period, sec	Frequency, Hz	Difference	Datawell
2.9091	0.34375	-0.0519	-0.0000
2.9767	0.33594	-0.0522	-0.0000
3.0476	0.32813	-0.0524	-0.0000
3.1220	0.32031	-0.0527	-0.0001
3.2000	0.31250	-0.0530	-0.0001
3.2821	0.30469	-0.0533	-0.0001
3.3684	0.29688	-0.0536	-0.0001
3.4595	0.28906	-0.0539	-0.0001
3.5556	0.28125	-0.0543	-0.0001
3.6571	0.27344	-0.0546	-0.0001
3.7647	0.26563	-0.0550	-0.0001
3.8788	0.25781	-0.0554	-0.0001
4.0000	0.25000	-0.0558	-0.0001
4.1290	0.24219	-0.0562	-0.0002
4.2667	0.23438	-0.0567	-0.0002
4.4138	0.22656	-0.0572	-0.0002
4.5714	0.21875	-0.0577	-0.0002
4.7407	0.21094	-0.0582	-0.0003
4.9231	0.20313	-0.0588	-0.0003
5.1200	0.19531	-0.0594	-0.0004
5.3333	0.18750	-0.0601	-0.0004
5.5652	0.17969	-0.0607	-0.0005
5.8182	0.17188	-0.0615	-0.0006
6.0952	0.16406	-0.0623	-0.0008
6.4000	0.15625	-0.0631	-0.0009
6.7368	0.14844	-0.0640	-0.0011
7.1111	0.14063	-0.0649	-0.0014
7.5294	0.13281	-0.0659	-0.0018
8.0000	0.12500	-0.0670	-0.0023
8.5333	0.11719	-0.0681	-0.0029
9.1429	0.10938	-0.0693	-0.0039
9.8462	0.10156	-0.0705	-0.0052
10.6667	0.09375	-0.0718	-0.0071
11.6364	0.08594	-0.0730	-0.0100
12.8000	0.07813	-0.0741	-0.0146
14.2222	0.07031	-0.0749	-0.0220
16.0000	0.06250	-0.0751	-0.0345
18.2857	0.05469	-0.0739	-0.0569
21.3333	0.04688	-0.0698	-0.0984

Table A2

Waverider 66967 Calibration 2/18/81

Period, sec	Frequency, Hz	Difference	Datawell
2.0000	0.50000	-0.0515	-0.0000
2.0317	0.49219	-0.0516	-0.0000
2.0645	0.48438	-0.0517	-0.0000
2.0984	0.47656	-0.0518	-0.0000
2.1333	0.46875	-0.0519	-0.0000
2.1695	0.46094	-0.0520	-0.0000
2.2069	0.45313	-0.0521	-0.0000
2.2456	0.44531	-0.0522	-0.0000
2.2857	0.43750	-0.0523	-0.0000
2.3273	0.42969	-0.0524	-0.0000
2.3704	0.42188	-0.0526	-0.0000
2.4151	0.41406	-0.0527	-0.0000
2.4615	0.40625	-0.0528	-0.0000
2.5098	0.39844	-0.0530	-0.0000
2.5600	0.39063	-0.0531	-0.0000
2.6122	0.38281	-0.0533	-0.0000
2.6667	0.37500	-0.0534	-0.0000
2.7234	0.36719	-0.0536	-0.0000
2.7826	0.35938	-0.0538	-0.0000
2.8444	0.35156	-0.0539	-0.0000
2.9091	0.34375	-0.0541	-0.0000
2.9767	0.33594	-0.0543	-0.0000
3.0476	0.32813	-0.0545	-0.0000
3.1220	0.32031	-0.0547	-0.0001
3.2000	0.31250	-0.0549	-0.0001
3.2821	0.30469	-0.0552	-0.0001
3.3684	0.29688	-0.0554	-0.0001
3.4595	0.28906	-0.0557	-0.0001
3.5556	0.28125	-0.0559	-0.0001
3.6571	0.27344	-0.0562	-0.0001
3.7647	0.26563	-0.0565	-0.0001
3.8788	0.25781	-0.0568	-0.0001
4.0000	0.25000	-0.0572	-0.0001
4.1290	0.24219	-0.0575	-0.0002
4.2667	0.23438	-0.0579	-0.0002
4.4138	0.22656	-0.0583	-0.0002
4.5714	0.21875	-0.0587	-0.0002
4.7407	0.21094	-0.0591	-0.0003
4.9231	0.20313	-0.0596	-0.0003
5.1200	0.19531	-0.0601	-0.0004

(Continued)

Table A2 (Concluded)

Period, sec	Frequency, Hz	Difference	Datawell
5.3333	0.18750	-0.0607	-0.0004
5.5652	0.17969	-0.0613	-0.0005
5.8182	0.17188	-0.0619	-0.0006
6.0952	0.16406	-0.0626	-0.0008
6.4000	0.15625	-0.0633	-0.0009
6.7368	0.14844	-0.0641	-0.0011
7.1111	0.14063	-0.0650	-0.0014
7.5294	0.13281	-0.0659	-0.0018
8.0000	0.12500	-0.0670	-0.0023
8.5333	0.11719	-0.0681	-0.0029
9.1429	0.10938	-0.0694	-0.0039
9.8462	0.10156	-0.0708	-0.0052
10.6667	0.09375	-0.0723	-0.0071
11.6364	0.08594	-0.0740	-0.0100
12.8000	0.07813	-0.0759	-0.0146
14.2222	0.07031	-0.0779	-0.0220
16.0000	0.06250	-0.0801	-0.0345
18.2857	0.05469	-0.0823	-0.0569
21.3333	0.04688	-0.0841	-0.0984

Table A3

Waverider 66968 Calibration 8/1/80

Period, sec	Frequency, Hz	Difference	Datawell
2.0000	0.50000	-0.0134	-0.0000
2.0317	0.49219	-0.0135	-0.0000
2.0645	0.48438	-0.0136	-0.0000
2.0984	0.47656	-0.0138	-0.0000
2.1333	0.46875	-0.0139	-0.0000
2.1695	0.46094	-0.0141	-0.0000
2.2069	0.45313	-0.0142	-0.0000
2.2456	0.44531	-0.0144	-0.0000
2.2857	0.43750	-0.0145	-0.0000
2.3273	0.42969	-0.0147	-0.0000
2.3704	0.42188	-0.0149	-0.0000
2.4151	0.41406	-0.0151	-0.0000
2.4615	0.40625	-0.0153	-0.0000
2.5098	0.39844	-0.0155	-0.0000
2.5600	0.39063	-0.0157	-0.0000
2.6122	0.38281	-0.0159	-0.0000
2.6667	0.37500	-0.0161	-0.0000
2.7234	0.36719	-0.0163	-0.0000
2.7826	0.35938	-0.0165	-0.0000
2.8444	0.35156	-0.0168	-0.0000
2.9091	0.34375	-0.0170	-0.0000
2.9767	0.33594	-0.0173	-0.0000
3.0476	0.32813	-0.0176	-0.0000
3.1220	0.32031	-0.0179	-0.0001
3.2000	0.31250	-0.0182	-0.0001
3.2821	0.30469	-0.0185	-0.0001
3.3684	0.29688	-0.0188	-0.0001
3.4595	0.28906	-0.0191	-0.0001
3.5556	0.28125	-0.0195	-0.0001
3.6571	0.27344	-0.0199	-0.0001
3.7647	0.26563	-0.0203	-0.0001
3.8788	0.25781	-0.0207	-0.0001
4.0000	0.25000	-0.0211	-0.0001
4.1290	0.24219	-0.0216	-0.0002
4.2667	0.23438	-0.0220	-0.0002
4.4138	0.22656	-0.0225	-0.0002
4.5714	0.21875	-0.0231	-0.0002
4.7407	0.21094	-0.0237	-0.0003
4.9231	0.20313	-0.0243	-0.0003
5.1200	0.19531	-0.0249	-0.0004

(Continued)

Table A3 (Concluded)

Period, sec	Frequency, Hz	Difference	Datawell
5.3333	0.18750	-0.0256	-0.0004
5.5652	0.17969	-0.0263	-0.0005
5.8182	0.17188	-0.0271	-0.0006
6.0952	0.16406	-0.0279	-0.0008
6.4000	0.15625	-0.0288	-0.0009
6.7368	0.14844	-0.0297	-0.0011
7.1111	0.14063	-0.0307	-0.0014
7.5294	0.13281	-0.0317	-0.0018
8.0000	0.12500	-0.0329	-0.0023
8.5333	0.11719	-0.0340	-0.0029
9.1429	0.10938	-0.0353	-0.0039
9.8462	0.10156	-0.0366	-0.0052
10.6667	0.09375	-0.0379	-0.0071
11.6364	0.08594	-0.0392	-0.0100
12.8000	0.07813	-0.0404	-0.0146
14.2222	0.07031	-0.0413	-0.0220
16.0000	0.06250	-0.0415	-0.0345
18.2857	0.05469	-0.0403	-0.0569
21.3333	0.04688	-0.0362	-0.0984

Table A4

Waverider 66968 Calibration 5/12/81

Period, sec	Frequency, Hz	Difference	Datawell
2.0000	0.50000	-0.0118	-0.0000
2.0317	0.49219	-0.0119	-0.0000
2.0645	0.48438	-0.0120	-0.0000
2.0984	0.47656	-0.0120	-0.0000
2.1333	0.46875	-0.0121	-0.0000
2.1695	0.46094	-0.0122	-0.0000
2.2069	0.45313	-0.0122	-0.0000
2.2456	0.44531	-0.0123	-0.0000
2.2857	0.43750	-0.0124	-0.0000
2.3273	0.42969	-0.0125	-0.0000
2.3704	0.42188	-0.0126	-0.0000
2.4151	0.41406	-0.0127	-0.0000
2.4615	0.40625	-0.0127	-0.0000
2.5098	0.39844	-0.0128	-0.0000
2.5600	0.39063	-0.0129	-0.0000
2.6122	0.38281	-0.0130	-0.0000
2.6667	0.37500	-0.0132	-0.0000
2.7234	0.36719	-0.0133	-0.0000
2.7826	0.35938	-0.0134	-0.0000
2.8444	0.35156	-0.0135	-0.0000
2.9091	0.34375	-0.0136	-0.0000
2.9767	0.33594	-0.0138	-0.0000
3.0476	0.32813	-0.0139	-0.0000
3.1220	0.32031	-0.0140	-0.0001
3.2000	0.31250	-0.0142	-0.0001
3.2821	0.30469	-0.0143	-0.0001
3.3684	0.29688	-0.0145	-0.0001
3.4595	0.28906	-0.0147	-0.0001
3.5556	0.28125	-0.0148	-0.0001
3.6571	0.27344	-0.0150	-0.0001
3.7647	0.26563	-0.0152	-0.0001
3.8788	0.25781	-0.0154	-0.0001
4.0000	0.25000	-0.0157	-0.0001
4.1290	0.24219	-0.0159	-0.0002
4.2667	0.23438	-0.0161	-0.0002
4.4138	0.22656	-0.0164	-0.0002
4.5714	0.21875	-0.0167	-0.0002
4.7407	0.21094	-0.0170	-0.0003
4.9231	0.20313	-0.0173	-0.0003
5.1200	0.19531	-0.0176	-0.0004

(Continued)

Table A4 (Concluded)

Period, sec	Frequency, Hz	Difference	Datawell
5.3333	0.18750	-0.0180	-0.0004
5.5652	0.17969	-0.0183	-0.0005
5.8182	0.17188	-0.0188	-0.0006
6.0952	0.16406	-0.0192	-0.0008
6.4000	0.15625	-0.0197	-0.0009
6.7368	0.14844	-0.0202	-0.0011
7.1111	0.14063	-0.0207	-0.0014
7.5294	0.13281	-0.0213	-0.0018
8.0000	0.12500	-0.0220	-0.0023
8.5333	0.11719	-0.0227	-0.0029
9.1429	0.10938	-0.0234	-0.0039
9.8462	0.10156	-0.0243	-0.0052
10.6667	0.09375	-0.0252	-0.0071
11.6364	0.08594	-0.0261	-0.0100
12.8000	0.07813	-0.0271	-0.0146
14.2222	0.07031	-0.0281	-0.0220
16.0000	0.06250	-0.0291	-0.0345
18.2857	0.05469	-0.0298	-0.0569
21.3333	0.04688	-0.0298	-0.0984

Table A5

Waverider 66969 Calibration 8/1/80

Period, sec	Frequency, Hz	Difference	Datawell
2.0000	0.50000	-0.0212	-0.0000
2.0317	0.49219	-0.0214	-0.0000
2.0645	0.48438	-0.0215	-0.0000
2.0984	0.47656	-0.0217	-0.0000
2.1333	0.46875	-0.0218	-0.0000
2.1695	0.46094	-0.0220	-0.0000
2.2069	0.45313	-0.0221	-0.0000
2.2456	0.44531	-0.0223	-0.0000
2.2857	0.43750	-0.0225	-0.0000
2.3273	0.42969	-0.0227	-0.0000
2.3704	0.42188	-0.0229	-0.0000
2.4151	0.41406	-0.0231	-0.0000
2.4615	0.40625	-0.0233	-0.0000
2.5098	0.39844	-0.0235	-0.0000
2.5600	0.39063	-0.0237	-0.0000
2.6122	0.38281	-0.0240	-0.0000
2.6667	0.37500	-0.0242	-0.0000
2.7234	0.36719	-0.0244	-0.0000
2.7826	0.35938	-0.0247	-0.0000
2.8444	0.35156	-0.0250	-0.0000
2.9091	0.34375	-0.0252	-0.0000
2.9767	0.33594	-0.0255	-0.0000
3.0476	0.32813	-0.0258	-0.0000
3.1220	0.32031	-0.0262	-0.0001
3.2000	0.31250	-0.0265	-0.0001
3.2821	0.30469	-0.0268	-0.0001
3.3684	0.29688	-0.0272	-0.0001
3.4595	0.28906	-0.0276	-0.0001
3.5556	0.28125	-0.0279	-0.0001
3.6571	0.27344	-0.0284	-0.0001
3.7647	0.26563	-0.0288	-0.0001
3.8788	0.25781	-0.0292	-0.0001
4.0000	0.25000	-0.0297	-0.0001
4.1290	0.24219	-0.0302	-0.0002
4.2667	0.23438	-0.0308	-0.0002
4.4138	0.22656	-0.0313	-0.0002
4.5714	0.21875	-0.0319	-0.0002
4.7407	0.21094	-0.0325	-0.0003
4.9231	0.20313	-0.0332	-0.0003
5.1200	0.19531	-0.0339	-0.0004

(Continued)

Table A5 (Concluded)

Period, sec	Frequency, Hz	Difference	Datawell
5.3333	0.18750	-0.0346	-0.0004
5.5652	0.17969	-0.0354	-0.0005
5.8182	0.17188	-0.0363	-0.0006
6.0952	0.16406	-0.0372	-0.0008
6.4000	0.15625	-0.0381	-0.0009
6.7368	0.14844	-0.0391	-0.0011
7.1111	0.14063	-0.0402	-0.0014
7.5294	0.13281	-0.0414	-0.0018
8.0000	0.12500	-0.0426	-0.0023
8.5333	0.11719	-0.0439	-0.0029
9.1429	0.10938	-0.0453	-0.0039
9.8462	0.10156	-0.0467	-0.0052
10.6667	0.09375	-0.0482	-0.0071
11.6364	0.08594	-0.0496	-0.0100
12.8000	0.07813	-0.0509	-0.0146
14.2222	0.07031	-0.0518	-0.0220
16.0000	0.06250	-0.0519	-0.0345
18.2857	0.05469	-0.0506	-0.0569
21.3333	0.04688	-0.0459	-0.0984

Table A6

Waverider 66969 Calibration 2/18/81

Period, sec	Frequency, Hz	Difference	Datawell
2.0000	0.50000	-0.0384	-0.0000
2.0317	0.49219	-0.0384	-0.0000
2.0645	0.48438	-0.0384	-0.0000
2.0984	0.47656	-0.0384	-0.0000
2.1333	0.46875	-0.0384	-0.0000
2.1695	0.46094	-0.0384	-0.0000
2.2069	0.45313	-0.0384	-0.0000
2.2456	0.44531	-0.0384	-0.0000
2.2857	0.43750	-0.0385	-0.0000
2.3273	0.42969	-0.0385	-0.0000
2.3704	0.42188	-0.0385	-0.0000
2.4151	0.41406	-0.0385	-0.0000
2.4615	0.40625	-0.0385	-0.0000
2.5098	0.39844	-0.0385	-0.0000
2.5600	0.39063	-0.0385	-0.0000
2.6122	0.38281	-0.0386	-0.0000
2.6667	0.37500	-0.0386	-0.0000
2.7234	0.36719	-0.0386	-0.0000
2.7826	0.35938	-0.0386	-0.0000
2.8444	0.35156	-0.0386	-0.0000
2.9091	0.34375	-0.0387	-0.0000
2.9767	0.33594	-0.0387	-0.0000
3.0476	0.32813	-0.0387	-0.0000
3.1220	0.32031	-0.0387	-0.0001
3.2000	0.31250	-0.0388	-0.0001
3.2821	0.30469	-0.0388	-0.0001
3.3684	0.29688	-0.0388	-0.0001
3.4595	0.28906	-0.0388	-0.0001
3.5556	0.28125	-0.0389	-0.0001
3.6571	0.27344	-0.0389	-0.0001
3.7647	0.26563	-0.0390	-0.0001
3.8788	0.25781	-0.0390	-0.0001
4.0000	0.25000	-0.0390	-0.0001
4.1290	0.24219	-0.0391	-0.0002
4.2667	0.23438	-0.0391	-0.0002
4.4138	0.22656	-0.0392	-0.0002
4.5714	0.21875	-0.0392	-0.0002
4.7407	0.21094	-0.0393	-0.0003
4.9231	0.20313	-0.0394	-0.0003
5.1200	0.19531	-0.0394	-0.0004

(Continued)

Table A6 (Concluded)

Period, sec	Frequency, Hz	Difference	Datawell
5.3333	0.18750	-0.0395	-0.0004
5.5652	0.17969	-0.0396	-0.0005
5.8182	0.17188	-0.0397	-0.0006
6.0952	0.16406	-0.0398	-0.0008
6.4000	0.15625	-0.0399	-0.0009
6.7368	0.14844	-0.0400	-0.0011
7.1111	0.14063	-0.0401	-0.0014
7.5294	0.13281	-0.0403	-0.0018
8.0000	0.12500	-0.0405	-0.0023
8.5333	0.11719	-0.0407	-0.0029
9.1429	0.10938	-0.0409	-0.0039
9.8462	0.10156	-0.0412	-0.0052
10.6667	0.09375	-0.0415	-0.0071
11.6364	0.08594	-0.0419	-0.0100
12.8000	0.07813	-0.0424	-0.0146
14.2222	0.07031	-0.0430	-0.0220
16.0000	0.06250	-0.0437	-0.0345
18.2857	0.05469	-0.0448	-0.0569
21.3333	0.04688	-0.0462	-0.0984

Table A7

Waverider 66969 Calibration 5/12/81

Period, sec	Frequency, Hz	Difference	Datawell
2.0000	0.50000	-0.0240	-0.0000
2.0317	0.49219	-0.0241	-0.0000
2.0645	0.48438	-0.0243	-0.0000
2.0984	0.47656	-0.0244	-0.0000
2.1000	0.46875	-0.0245	-0.0000
2.1695	0.46094	-0.0247	-0.0000
2.2069	0.45313	-0.0248	-0.0000
2.2456	0.44531	-0.0249	-0.0000
2.2857	0.43750	-0.0251	-0.0000
2.3273	0.42969	-0.0253	-0.0000
2.3704	0.42188	-0.0254	-0.0000
2.4151	0.41406	-0.0256	-0.0000
2.4615	0.40625	-0.0258	-0.0000
2.5098	0.39844	-0.0259	-0.0000
2.5600	0.39063	-0.0261	-0.0000
2.6122	0.38281	-0.0263	-0.0000
2.6667	0.37500	-0.0265	-0.0000
2.7234	0.36719	-0.0267	-0.0000
2.7826	0.35938	-0.0269	-0.0000
2.8444	0.35156	-0.0272	-0.0000
2.9091	0.34375	-0.0274	-0.0000
2.9767	0.33594	-0.0276	-0.0000
3.0476	0.32813	-0.0279	-0.0000
3.1220	0.32031	-0.0281	-0.0001
3.2000	0.31250	-0.0284	-0.0001
3.2821	0.30469	-0.0287	-0.0001
3.3684	0.29688	-0.0290	-0.0001
3.4595	0.28906	-0.0293	-0.0001
3.5556	0.28125	-0.0296	-0.0001
3.6571	0.27344	-0.0299	-0.0001
3.7647	0.26563	-0.0303	-0.0001
3.8788	0.25781	-0.0307	-0.0001
4.0000	0.25000	-0.0311	-0.0001
4.1290	0.24219	-0.0315	-0.0002
4.2667	0.23438	-0.0319	-0.0002
4.4138	0.22656	-0.0323	-0.0002
4.5714	0.21875	-0.0328	-0.0002
4.7407	0.21094	-0.0333	-0.0003
4.9231	0.20313	-0.0338	-0.0003
5.1200	0.19531	-0.0343	-0.0004

(Continued)

Table A7 (Concluded)

Period, sec	Frequency, Hz	Difference	Datawell
5.3333	0.18750	-0.0349	-0.0004
5.5652	0.17969	-0.0355	-0.0005
5.8182	0.17188	-0.0362	-0.0006
6.0952	0.16406	-0.0368	-0.0008
6.4000	0.15625	-0.0375	-0.0009
6.7368	0.14844	-0.0383	-0.0011
7.1111	0.14063	-0.0391	-0.0014
7.5294	0.13281	-0.0399	-0.0018
8.0000	0.12500	-0.0407	-0.0023
8.5333	0.11719	-0.0415	-0.0029
9.1429	0.10938	-0.0424	-0.0039
9.8462	0.10156	-0.0431	-0.0052
10.6667	0.09375	-0.0438	-0.0071
11.6364	0.08594	-0.0443	-0.0100
12.8000	0.07813	-0.0444	-0.0146
14.2222	0.07031	-0.0439	-0.0220
16.0000	0.06250	-0.0421	-0.0345
18.2857	0.05469	-0.0382	-0.0569
21.3333	0.04688	-0.0299	-0.0984

Table A8

Waverider 66977 Calibration 9/3/80

Period, sec	Frequency, Hz	Difference	Datawell
2.0000	0.50000	-0.0330	-0.0000
2.0317	0.49219	-0.0331	-0.0000
2.0645	0.48438	-0.0332	-0.0000
2.0984	0.47656	-0.0333	-0.0000
2.1333	0.46875	-0.0334	-0.0000
2.1695	0.46094	-0.0335	-0.0000
2.2069	0.45313	-0.0337	-0.0000
2.2456	0.44531	-0.0338	-0.0000
2.2857	0.43750	-0.0339	-0.0000
2.3273	0.42969	-0.0340	-0.0000
2.3704	0.42188	-0.0342	-0.0000
2.4151	0.41406	-0.0343	-0.0000
2.4615	0.40625	-0.0345	-0.0000
2.5098	0.39844	-0.0346	-0.0000
2.5600	0.39063	-0.0348	-0.0000
2.6122	0.38281	-0.0349	-0.0000
2.6667	0.37500	-0.0351	-0.0000
2.7234	0.36719	-0.0353	-0.0000
2.7826	0.35938	-0.0355	-0.0000
2.8444	0.35156	-0.0357	-0.0000
2.9091	0.34375	-0.0359	-0.0000
2.9767	0.33594	-0.0361	-0.0000
3.0476	0.32813	-0.0363	-0.0000
3.1220	0.32031	-0.0365	-0.0001
3.2000	0.31250	-0.0368	-0.0001
3.2821	0.30469	-0.0370	-0.0001
3.3684	0.29688	-0.0373	-0.0001
3.4595	0.28906	-0.0375	-0.0001
3.5556	0.28125	-0.0378	-0.0001
3.6571	0.27344	-0.0381	-0.0001
3.7647	0.26563	-0.0384	-0.0001
3.8788	0.25781	-0.0387	-0.0001
4.0000	0.25000	-0.0391	-0.0001
4.1290	0.24219	-0.0394	-0.0002
4.2667	0.23438	-0.0398	-0.0002
4.4138	0.22656	-0.0402	-0.0002
4.5714	0.21875	-0.0406	-0.0002
4.7407	0.21094	-0.0411	-0.0003
4.9231	0.20313	-0.0415	-0.0003
5.1200	0.19531	-0.0420	-0.0004

(Continued)

Table A8 (Concluded)

Period, sec	Frequency, Hz	Difference	Datawell
5.3333	0.18750	-0.0426	-0.0004
5.5652	0.17969	-0.0431	-0.0005
5.8182	0.17188	-0.0438	-0.0006
6.0952	0.16406	-0.0444	-0.0008
6.4000	0.15625	-0.0451	-0.0009
6.7368	0.14844	-0.0458	-0.0011
7.1111	0.14063	-0.0466	-0.0014
7.5294	0.13281	-0.0474	-0.0018
8.0000	0.12500	-0.0483	-0.0023
8.5333	0.11719	-0.0493	-0.0029
9.1429	0.10938	-0.0503	-0.0039
9.8462	0.10156	-0.0513	-0.0052
10.6667	0.09375	-0.0523	-0.0071
11.6364	0.08594	-0.0534	-0.0100
12.8000	0.07813	-0.0543	-0.0146
14.2222	0.07031	-0.0550	-0.0220
16.0000	0.06250	-0.0552	-0.0345
18.2857	0.05469	-0.0543	-0.0569
21.3333	0.04688	-0.0512	-0.0984

Table A9

Waverider 66977 Calibration 9/23/81

Period, sec	Frequency, Hz	Difference	Datawell
2.0000	0.50000	-0.0403	-0.0000
2.0317	0.49219	-0.0404	-0.0000
2.0645	0.48438	-0.0406	-0.0000
2.0984	0.47656	-0.0407	-0.0000
2.1333	0.46875	-0.0408	-0.0000
2.1695	0.46094	-0.0410	-0.0000
2.2069	0.45313	-0.0412	-0.0000
2.2456	0.44531	-0.0413	-0.0000
2.2857	0.43750	-0.0415	-0.0000
2.3273	0.42969	-0.0417	-0.0000
2.3704	0.42188	-0.0418	-0.0000
2.4151	0.41406	-0.0420	-0.0000
2.4615	0.40625	-0.0422	-0.0000
2.5098	0.39844	-0.0424	-0.0000
2.5600	0.39063	-0.0426	-0.0000
2.6122	0.38281	-0.0428	-0.0000
2.6667	0.37500	-0.0430	-0.0000
2.7234	0.36719	-0.0433	-0.0000
2.7826	0.35938	-0.0435	-0.0000
2.8444	0.35156	-0.0438	-0.0000
2.9091	0.34375	-0.0440	-0.0000
2.9767	0.33594	-0.0443	-0.0000
3.0476	0.32813	-0.0445	-0.0000
3.1220	0.32031	-0.0448	-0.0001
3.2000	0.31250	-0.0451	-0.0001
3.2821	0.30469	-0.0454	-0.0001
3.3684	0.29688	-0.0458	-0.0001
3.4595	0.28906	-0.0461	-0.0001
3.5556	0.28125	-0.0465	-0.0001
3.6571	0.27344	-0.0468	-0.0001
3.7647	0.26563	-0.0472	-0.0001
3.8788	0.25781	-0.0476	-0.0001
4.0000	0.25000	-0.0481	-0.0001
4.1290	0.24219	-0.0485	-0.0002
4.2667	0.23438	-0.0490	-0.0002
4.4138	0.22656	-0.0495	-0.0002
4.5714	0.21875	-0.0500	-0.0002
4.7407	0.21094	-0.0506	-0.0003
4.9231	0.20313	-0.0512	-0.0003
5.1200	0.19531	-0.0518	-0.0004

(Continued)

Table A9 (Concluded)

Period, sec	Frequency, Hz	Difference	Datawell
5.3333	0.18750	-0.0524	-0.0004
5.5652	0.17969	-0.0531	-0.0005
5.8182	0.17188	-0.0539	-0.0006
6.0952	0.16406	-0.0546	-0.0008
6.4000	0.15625	-0.0554	-0.0009
6.7368	0.14844	-0.0563	-0.0011
7.1111	0.14063	-0.0572	-0.0014
7.5294	0.13281	-0.0582	-0.0018
8.0000	0.12500	-0.0591	-0.0023
8.5333	0.11719	-0.0602	-0.0029
9.1429	0.10938	-0.0612	-0.0039
9.8462	0.10156	-0.0622	-0.0052
10.6667	0.09375	-0.0632	-0.0071
11.6364	0.08594	-0.0640	-0.0100
12.8000	0.07813	-0.0645	-0.0146
14.2222	0.07031	-0.0644	-0.0220
16.0000	0.06250	-0.0632	-0.0345
18.2857	0.05469	-0.0600	-0.0569
21.3333	0.04688	-0.0525	-0.0984

Temperature-Related Error

7. It has been determined that for some unknown number of Waveriders the sensitivity is drifting downward, possibly since manufacture, on the average of about 1 percent per year. Sensitivity loss from some unknown chemical reaction is related to increases in electrical conductivity of the fluid surrounding the accelerometer. This drift is identified from successive calibrations over a period of years.

8. Recently, Datawell has introduced an improved modulator printed-circuit board for bringing calibrations within specification and for preventing further decreases in sensitivity. This modification has been made for buoy 66968, so the temperature-related error correction need not be applied. For all the other buoys--e.g., 66967, 66969, and 66977--it is recommended that the correction be used. Datawell has provided curves for correction of calibration and buoy temperature when the buoy is measuring waves in the ocean. The NOAA Engineering Support Office has, in turn, developed a table based on the Datawell curve which can be entered with the uncorrected difference error value d and the temperature of the water during the time of buoy operation to determine the difference error correction (Table A10). The difference error correction is added to d to obtain the corrected difference error, D. For temperatures during buoy operation greater than the buoy temperature during calibration (i.e., 22.4° C), no correction is necessary. Water temperature values may best be determined from Table 9 in the section entitled Water Characteristics in the main text of this report or from the FRF Monthly Preliminary Data Summaries (see References).

9. Since these error corrections are oscillation period dependent, their application requires that the wave data be decomposed into amplitude coefficients or variance-spectrum coefficients for each frequency or period. A less accurate but also less complicated procedure would be to apply a single correction to the wave height H_{m_o} based on the peak spectral wave period and an average water temperature estimate. For correction of amplitudes or derived parameters linearly related to amplitude, a correction factor $F(T)$ can be obtained from the sum of the Datawell DW and temperature corrected difference error D using

$$F(T) = \frac{1}{1 + (DW + D)} \tag{2}$$

Table A10

Increase in Waverider Sensitivity from Water Temperature Lower than Calibration Temperature*

Difference	Water Temperature, °C 22.4	20	18	16	14	12	10	8
0.00	0.000	0.001	0.001	0.001	0.001	0.000	-0.000	-0.002
-0.01	0.000	0.007	0.008	0.009	0.010	0.011	0.011	0.011
-0.02	0.000	0.009	0.012	0.014	0.016	0.018	0.019	0.020
-0.03	0.000	0.009	0.013	0.016	0.019	0.021	0.024	0.026
-0.04	0.000	0.008	0.012	0.016	0.020	0.023	0.027	0.029
-0.05	0.000	0.006	0.011	0.016	0.020	0.024	0.028	0.032
-0.06	0.000	0.004	0.010	0.015	0.020	0.025	0.030	0.034
-0.07	0.000	0.003	0.009	0.015	0.021	0.026	0.031	0.036
-0.08	0.000	0.003	0.010	0.017	0.023	0.029	0.034	0.039
-0.09	0.000	0.006	0.013	0.019	0.026	0.032	0.038	0.043
-0.10	0.000	0.010	0.017	0.024	0.031	0.037	0.043	0.049

* Based on a figure provided by Datawell.

which can be applied by multiplying the uncorrected amplitude by F(T) for T equal to the peak spectral wave period. For correction of parameters related to the square of the amplitude--i.e., total energy or variance spectrum coefficients--the following should be used:

$$[F(T)]^2 = \left[\frac{1}{1 + (DW + D)}\right]^2 \qquad (3)$$

10. To apply the correction, first the difference error between the Datawell predicted error and the error measured during calibration are determined. This difference error is then adjusted for the temperature-dependent increase in electrical conductivity before the Datawell predicted difference error and the corrected difference error are summed. Finally, the decrease in sensitivity (based on the wave period) is computed by adding 1 to the sum.

11. To demonstrate the use of the calibration results, the Waverider located 3 km from shore recorded a wave height H_{m_o} of 4.1 m and wave period

T_p of 14 sec on 13 November 1981. Table A2 of calibration results for 18 February 1981 (buoy 66967) gives a difference error d for 14 sec which is -0.0779. From Part V the water temperature is estimated to be 12° C. Entering Table 10 with the difference error -0.08 and water temperature 12°C, the correction is 0.029. This is added to the uncorrected difference error d to obtain the corrected difference error D : -0.0489 = -0.0779 + 0.029. The corrected difference error (D = -0.0489) is added to the Datawell predicted difference error (DW = -0.0220; see Table A2 for T_p = 14 sec), e.g., -0.0709 = -0.0489 + (-0.0220), and the sensitivity is computed by adding 1, or 0.9291 = 1 + (-0.0709).

12. This sensitivity is used to correct amplitudes and variance spectra coefficients for a 14-sec period.

Corrected amplitude = Uncorrected amplitude times F(t), or

$$\frac{4.1\text{m}}{0.9291} = 4.4 \quad (7\% \text{ increase})$$

and the corrected variance coefficient =

$$\frac{\text{Uncorrected Variance Coefficient}}{(0.9291)^2}$$

13. In general, the wave statistics errors are near 5 percent for wave periods less than 12 sec (12 sec is equal to the annual mean plus 1 standard deviation wave period). Errors of this magnitude are generally tolerable for most engineering applications, although it is worthwhile to know the error bounds for some design considerations. When investigating coastal phenomena involving a very long period swell of 15 sec or greater, such as surf beats and sediment accretion due to swell waves, these corrections will produce significant increases in the magnitudes of the wave parameters. Therefore, it is recommended that the corrections be used.

APPENDIX B: WAVE DATA

Wave data are summarized in the following forms:

a. Gage histories. Tables B1, B10, B19, and B28 include information about the gage, its installation, and major interruptions in the data collection. Short interruptions in the operational status of the gage are not mentioned.

b. Time histories. All wave height H_{m_o} and peak spectral wave period T_p values are plotted as functions of the time throughout the year (Figures B1, B2, B14, B15, B22, B23, B30, and B31). So that the sequence of the data can be followed easily, solid lines connect consecutive data points for times when there is a gap of fewer than 24 hr between observations.

c. Annual; seasonal; and monthly maxima, mean, and standard deviations of wave height and peak period. Mean H_{m_o} and standard deviation, mean T_p and standard deviation, and the extreme H_{m_o} for 1981 and for 1980 plus 1981 are listed in Tables B2, B3, B11, B12, B20, B21, B29, and B30. Also included is the total number of observations obtained. At four observations per day, the maximum number of observations per month (based on a 30-day period) is 120.

d. Extreme, mean, and standard deviations of wave height and mean and standard deviations of peak period. The data presented in the tables described above are also graphed (Figures B3, B4, B16, B17, B24, B25, B32, and B33) for each month and for the year for 1981 and for 1980 plus 1981. Standard deviations are presented as vertical bars originating at the mean value and extending to the mean plus one standard deviation value. The extreme values are plotted above. No extreme period values are presented.

e. Joint distribution functions of wave height versus peak period. Joint distribution tables for 1981 and for 1980 plus 1981 are tabulated for each year and season (Tables B4, B6, B13, B15, B22, B24, B31, and B33) and for each month (Tables B5, B7, B14, B16, B23, B25, B32, and B34). Each table gives the frequency (in parts per 1,000) for which H_{m_o} and T_p were within the specified intervals; these values can be converted to percent by dividing by 10. Marginal totals are also included. The row labeled "Total" gives the total number of observations out of 1,000 which fell within each specified period interval. The column "Total" gives the number of observations out of 1,000 which fell within each specified height interval.

f. Cumulative distributions of wave height. For each gage, H_{m_o} distributions are plotted in cumulative form (Figures B5, B6, B18, B19, B26, B27, B34, and B35.

g. Peak spectral wave period distributions. For each gage, T_p distributions are presented as annual and seasonal histograms for 1981 and for 1980 plus 1981 and monthly histograms for 1981 alone are presented (Figures B7, B8, B9, B20, B21, B28, B29, B36, and B37).

h. Persistence of wave heights. Tables B8, B9, B17, B18, B26, B27, B35, and B36 show the number of times throughout 1981 and 1980 plus 1981 that the specified wave height was equaled or exceeded at least once during each day of the duration (consecutive days) indicated. For example, for gage 625 (pier-end Baylor), wave heights equaled or exceeded 0.5 m 26 times for at least 1 day, 25 times for at least 2 days, 20 times for at least 3 days, 17 times for at least 4 days, etc. Therefore, on one occasion one would expect the height to have equaled or exceeded 0.5 m for 1 day exactly, on five occasions for 2 days, on three occasions for 3 days, on two occasions for 4 days, etc. Note that the height exceeded 1 m 41 times for 1 day or longer, while heights exceeded 0.5 m only 26 times for this same duration. This occurred because the longer durations of lower waves may be interspersed with shorter, but more frequent, intervals of higher waves. For example, the one time that wave heights exceeded 0.5 m for 55 days may represent four or five times that the height exceeded 1 m.

i. Wave roses. Wave roses showing the distribution of wave approach angles for gage 625 (pier-end Baylor) are presented for each month of 1981 and annually, seasonally, and monthly for 1980 plus 1981 (Figures B10, B11, and B12). The angles shown are referenced to true North. The FRF pier axis is oriented 69°58' east of true North. Northerly wave angles (e.g., those of less than of 70 deg) generally produce southward currents, while southerly wave angles, which are greater than 70 deg, produce northward currents.

j. Spectra. Sample spectra for gage 625 (pier-end Baylor) for days when wave heights exceeded 2 m at gage 625 are presented in Figure B13. The plots show energy density as a function of wave frequency every 6 hr througout the day.

Table B1

1981 Wave Gage History for Gage 625

Type of Gage and Location	Coordinates	Beginning of Proper Operation	End of Proper Operation	Explanation	Gage Length m	Gage Range m, MSL	Water Depth m, MSL	Distance from Baseline m
Baylor, continuous wire, sta 19+00 on FRF pier (597 m ENE of coordinates given) Duck, N.C.	36°1'54" N × 75°45'5" W	Nov 78	26 Jan 81	Gage off while instrument trailer was moved	9.4	-2.1 to -7.0	8.5	579
		29 Jan 81	25 Apr 81	Transducer problem				
		30 Apr 81	25 Jun 81	Bottom gage bracket broken				
		23 Jul 81		Replaced bottom bracket and transducer				

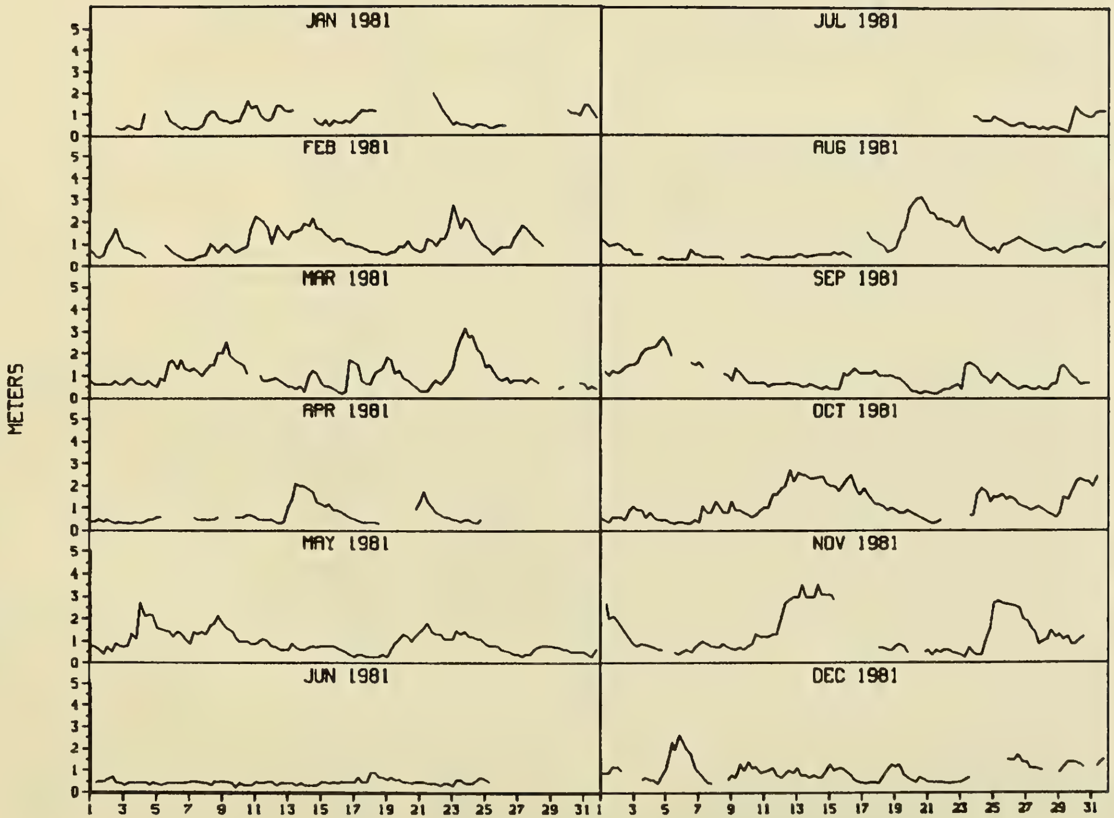


Figure B1. 1981 time history of wave heights for gage 625

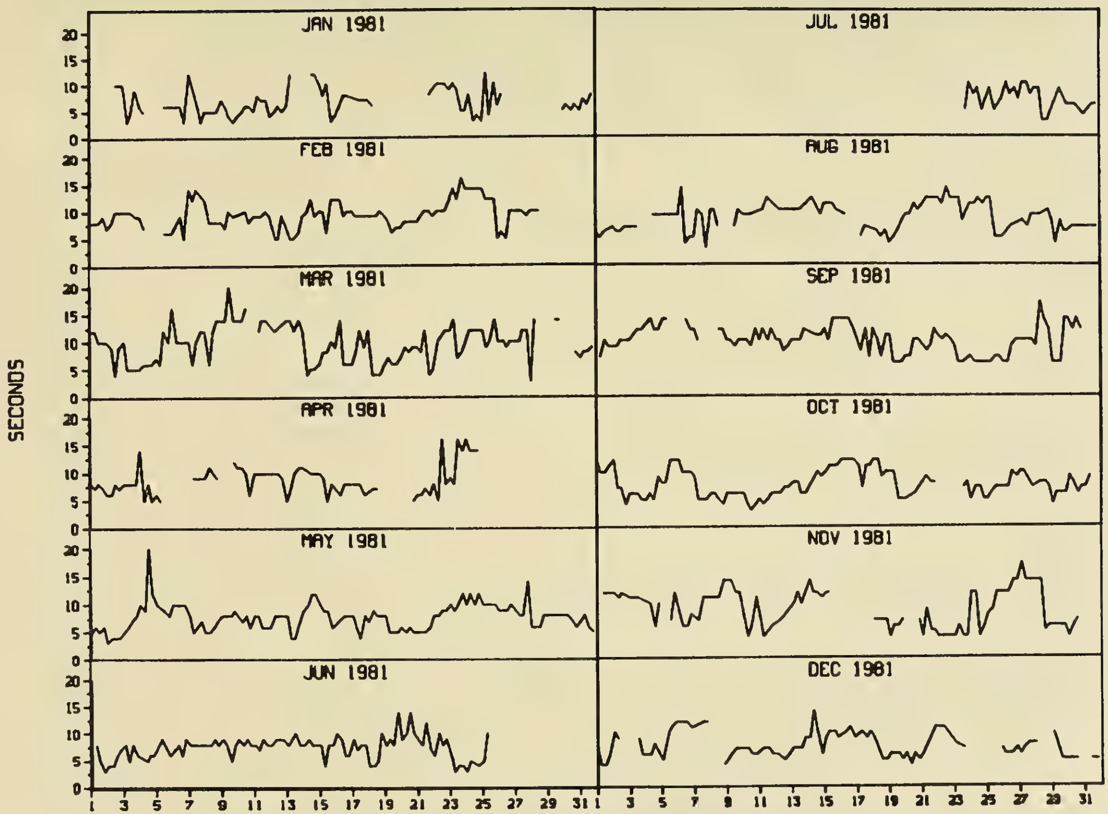


Figure B2. 1981 time history of wave periods for gage 625

Table B2

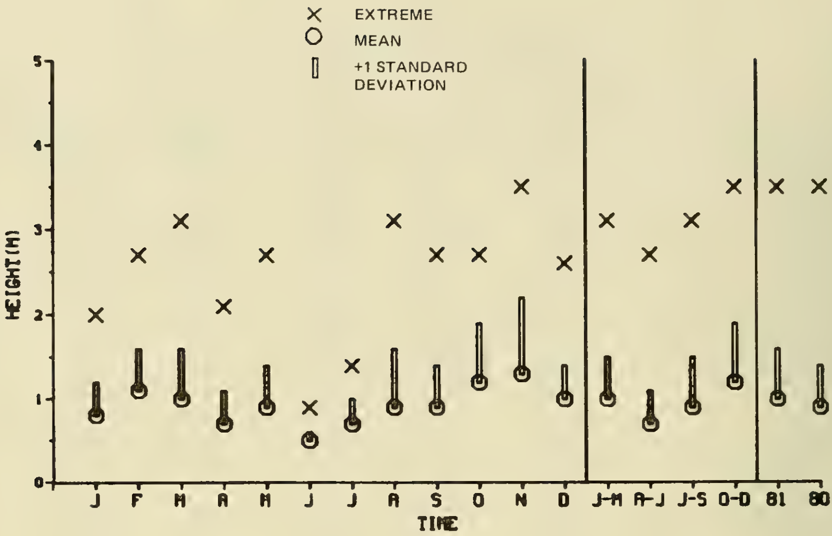
1981 Wave Statistics for Gage 625

Month	Mean Height, m	Standard Deviation Height, m	Mean Period	Standard Deviation Period	Extreme Height, m	Date	Number Observations
Jan	0.8	0.4	6.8	2.5	2.0	21	81
Feb	1.1	0.5	9.3	2.4	2.7	23	102
Mar	1.0	0.6	9.7	3.3	3.1	23	110
Apr	0.7	0.4	8.7	2.8	2.1	13	75
May	0.9	0.5	7.8	2.4	2.7	4	119
Jun	0.5	0.1	7.5	2.2	0.9	18	91
Jul	0.7	0.3	7.0	2.1	1.4	30	30
Aug	0.9	0.7	8.5	2.5	3.1	20	100
Sep	0.9	0.5	10.1	2.5	2.7	4	105
Oct	1.2	0.7	7.6	2.4	2.7	12	109
Nov	1.3	0.9	8.9	3.4	3.5	13	89
Dec	1.0	0.4	7.4	2.4	2.6	5	89
Jan-Mar	1.0	0.5	8.8	3.0	3.1	Mar	293
Apr-Jun	0.7	0.4	7.9	2.5	2.7	May	285
Jul-Sep	0.9	0.6	9.0	2.7	3.1	Aug	235
Oct-Dec	1.2	0.7	8.0	2.8	3.5	Nov	287
Annual	1.0	0.6	8.4	2.8	3.5	Nov	1,100

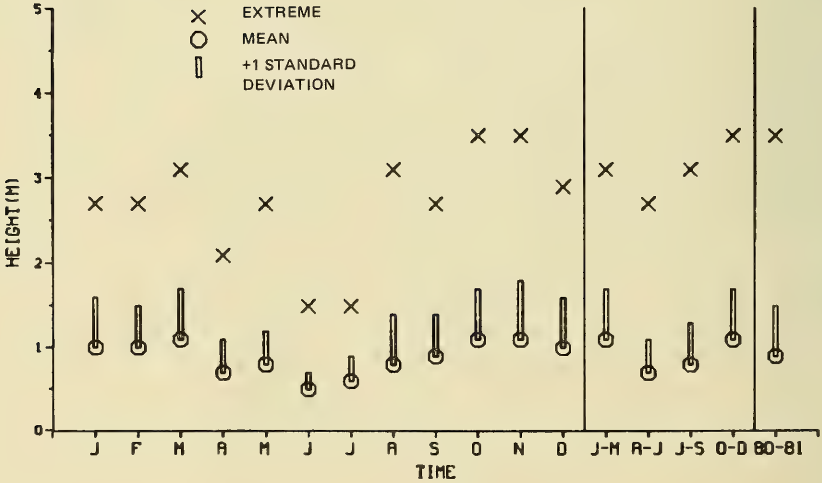
Table B3

1980 Plus 1981 Wave Statistics for Gage 625

Month	Mean Height, m	Standard Deviation Height, m	Mean Period	Standard Deviation Period	Extreme Height, m	Date	Number Observations
Jan	1.0	0.6	7.8	3.0	2.7	1980	153
Feb	1.0	0.5	9.3	2.6	2.7	1981	156
Mar	1.1	0.6	9.9	3.1	3.1	1981	187
Apr	0.7	0.4	9.3	2.7	2.1	1981	149
May	0.8	0.4	8.1	2.5	2.7	1981	206
Jun	0.5	0.2	7.6	2.1	1.5	1980	148
Jul	0.6	0.3	8.2	2.7	1.5	1980	96
Aug	0.8	0.6	8.9	2.8	3.1	1981	155
Sep	0.9	0.5	10.0	2.6	2.7	1981	154
Oct	1.1	0.6	8.5	2.7	3.5	1980	220
Nov	1.1	0.7	9.0	3.4	3.5	1981	207
Dec	1.0	0.6	8.0	2.6	2.9	1980	175
Jan-Mar	1.1	0.6	9.1	3.0	3.1	Mar 1981	496
Apr-Jun	0.7	0.4	8.3	2.5	2.7	May 1981	503
Jul-Sep	0.8	0.5	9.2	2.8	3.1	Aug 1981	405
Oct-Dec	1.1	0.6	8.5	3.0	3.5	Oct 1980	602
Annual	0.9	0.6	8.7	2.9	3.5	Oct 1980	2,006

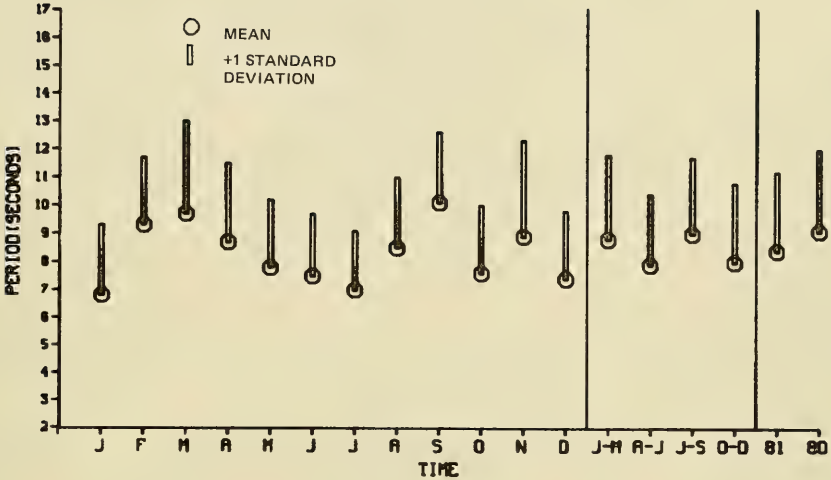


a. 1981

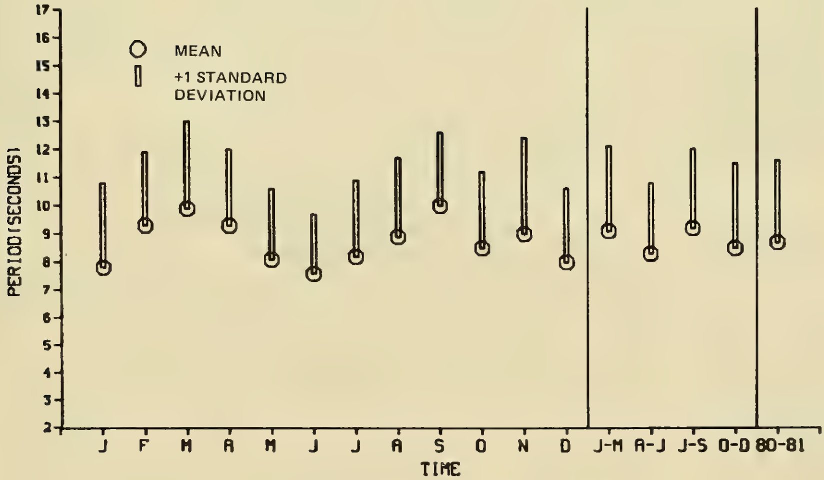


b. 1980 plus 1981

Figure B3. Monthly, seasonal, and annual extreme, mean, and standard deviation of wave height for gage 625



a. 1981



b. 1980 plus 1981

Figure B4. Monthly, seasonal, and annual mean and standard deviation of wave period for gage 625

Table B4

1981 Annual and Seasonal Joint Distribution of Wave Height

Versus Peak Period for Gage 625

ANNUAL
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	5	4	7	17	15	39	37	30	3	15	11	1	184
.50 - .99	.	9	37	40	65	37	61	50	63	18	30	19	.	429
1.00 - 1.49	.	.	7	35	45	33	15	15	35	6	19	10	.	220
1.50 - 1.99	.	.	.	13	19	6	4	5	13	4	9	8	2	83
2.00 - 2.49	.	.	.	.	3	4	2	6	4	6	15	8	1	49
2.50 - 2.99	.	.	.	.	1	3	5	2	3	.	9	2	.	25
3.00 - 3.49	.	.	.	.	.	.	1	2	2	2	2	1	.	10
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	2	.	.	2
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	14	46	95	150	98	127	117	150	39	101	59	4	

SEASONAL JAN-MAR
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	7	3	10	17	7	17	17	20	.	20	14	.	132
.50 - .99	.	20	24	34	44	27	61	72	72	.	48	31	.	433
1.00 - 1.49	.	.	10	41	41	24	14	14	61	.	34	10	.	249
1.50 - 1.99	.	.	.	14	20	3	7	14	34	.	7	17	3	119
2.00 - 2.49	.	.	.	.	.	.	3	10	.	.	10	20	.	43
2.50 - 2.99	.	.	.	.	.	3	.	.	3	.	7	3	.	16
3.00 - 3.49	.	.	.	.	.	.	3	.	.	.	.	.	.	3
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	27	37	99	122	64	105	127	190	0	126	95	3	

SEASONAL APR-JUN
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	4	7	18	46	32	116	49	21	.	4	21	.	318
.50 - .99	.	11	42	46	53	18	130	60	60	11	11	18	.	460
1.00 - 1.49	.	.	4	25	28	18	28	14	35	.	11	.	.	163
1.50 - 1.99	.	.	.	11	7	.	7	7	7	.	.	.	.	39
2.00 - 2.49	.	.	.	.	.	4	.	4	4	7	4	.	4	27
2.50 - 2.99	.	.	.	.	.	.	.	.	4	.	.	.	.	4
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	15	53	100	134	72	281	134	131	18	30	39	4	

(Continued)

Table B4 (Concluded)

SEASONAL JUL-SEP
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS)													TOTAL
	1.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 10.9	11.0- 11.9	12.0- 13.9	14.0- 16.9	17.0- LONGER	
0.00 - .49	.	13	.	.	.	21	9	77	72	9	13	9	4	227
.50 - .99	.	.	17	30	68	55	21	43	89	30	47	13	.	413
1.00 - 1.49	.	.	.	21	47	43	13	17	21	13	21	21	.	217
1.50 - 1.99	.	.	.	9	17	.	.	.	9	4	17	13	.	69
2.00 - 2.49	.	.	.	.	.	.	.	.	.	9	30	9	.	48
2.50 - 2.99	.	.	.	.	.	.	4	4	4	.	9	.	.	21
3.00 - 3.49	.	.	.	.	.	.	.	4	.	4	.	.	.	8
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	13	17	60	132	119	47	145	195	69	137	65	4	

SEASONAL OCT-DEC
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS)													TOTAL
	1.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 10.9	11.0- 11.9	12.0- 13.9	14.0- 16.9	17.0- LONGER	
0.00 - .49	.	.	3	.	3	.	10	14	14	3	24	.	.	71
.50 - .99	.	3	63	49	94	52	24	24	35	35	17	14	.	410
1.00 - 1.49	.	.	14	52	63	49	7	14	21	14	10	10	.	254
1.50 - 1.99	.	.	.	17	31	21	.	.	.	10	14	3	3	99
2.00 - 2.49	.	.	.	.	10	10	3	10	10	10	17	3	.	73
2.50 - 2.99	.	.	.	.	3	7	14	3	.	.	21	3	.	51
3.00 - 3.49	.	.	.	.	.	.	.	3	7	3	7	3	.	23
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	7	.	.	7
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	3	80	118	204	139	58	68	87	75	117	36	3	

Table B5

1981 Monthly Joint Distribution of Wave Height

Versus Peak Period for Gage 625

MONTH JAN
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	25	12	25	49	12	25	12	62	.	25	.	.	247
.50 - .99	.	62	62	37	62	37	49	25	37	.	25	.	.	396
1.00 - 1.49	.	.	.	123	86	49	12	.	37	.	12	.	.	319
1.50 - 1.99	.	.	.	.	12	.	.	12	.	.	.	.	.	24
2.00 - 2.49	.	.	.	.	.	.	12	.	.	.	.	.	.	12
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	87	74	185	209	98	98	49	136	0	62	0	0	

MONTH FEB
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	.	.	10	.	10	10	10	.	.	10	20	.	70
.50 - .99	.	.	.	20	29	20	88	127	78	.	39	10	.	411
1.00 - 1.49	.	.	.	.	20	29	29	39	98	.	29	20	.	264
1.50 - 1.99	.	.	.	39	10	.	10	20	78	.	10	10	.	177
2.00 - 2.49	.	.	.	.	.	.	.	29	.	.	10	29	.	68
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	10	.	.	10
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	0	0	69	59	59	137	225	254	0	108	89	0	

MONTH MAR
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	.	.	.	9	.	18	27	9	.	27	18	.	108
.50 - .99	.	9	18	45	45	27	45	55	91	.	73	73	.	481
1.00 - 1.49	.	.	27	18	27	.	.	.	45	.	55	9	.	181
1.50 - 1.99	.	.	.	.	36	9	9	9	18	.	9	36	9	135
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	18	27	.	45
2.50 - 2.99	.	.	.	.	.	9	.	.	9	.	9	9	.	36
3.00 - 3.49	.	.	.	.	.	.	9	.	.	.	.	.	.	9
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	9	45	63	117	45	81	91	172	0	191	172	9	

(Continued)

(Sheet 1 of 4)

MONTH APR
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	.	.	13	27	67	93	13	27	.	.	53	.	293
.50 - .99	.	.	.	53	53	13	107	80	93	40	13	53	.	505
1.00 - 1.49	.	.	13	27	27	27	.	13	27	.	.	.	.	134
1.50 - 1.99	.	.	.	.	13	.	.	.	13	.	.	.	.	26
2.00 - 2.49	.	.	.	.	.	.	.	.	13	27	.	.	.	40
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	0	13	93	120	107	200	106	173	67	13	106	0	

MONTH MAY
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	.	8	.	25	8	76	17	8	.	.	8	.	150
.50 - .99	.	8	42	50	76	25	118	42	50	.	17	.	.	428
1.00 - 1.49	.	.	.	42	50	25	67	25	67	.	25	.	.	301
1.50 - 1.99	.	.	.	25	8	.	17	17	8	.	.	.	.	75
2.00 - 2.49	.	.	.	.	.	8	.	8	.	.	8	.	8	32
2.50 - 2.99	.	.	.	.	.	.	.	.	8	.	.	.	.	8
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	8	50	117	159	66	278	109	141	0	50	8	8	

MONTH JUN
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	11	11	44	88	33	187	121	33	.	11	11	.	550
.50 - .99	.	22	77	33	22	11	165	66	44	.	.	11	.	451
1.00 - 1.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
1.50 - 1.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	33	88	77	110	44	352	187	77	0	11	22	0	

(Continued)

(Sheet 2 of 4)

MONTH JUL
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
	PERIOD(SECONDS)													
0.00 - .49	.	67	.	.	.	33	33	100	67	.	.	.	.	300
.50 - .99	.	.	33	133	33	67	67	100	67	.	.	.	.	500
1.00 - 1.49	.	.	.	33	167	.	.	.	.	.	.	.	.	200
1.50 - 1.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	67	33	166	200	100	100	200	134	0	0	0	0	

MONTH AUG
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
	PERIOD(SECONDS)													
0.00 - .49	.	10	.	.	.	20	.	110	90	.	10	10	.	250
.50 - .99	.	.	30	30	70	90	20	50	40	40	40	.	.	410
1.00 - 1.49	.	.	.	40	20	60	20	.	.	20	.	.	.	160
1.50 - 1.99	.	.	.	20	10	.	.	.	.	.	20	10	.	60
2.00 - 2.49	.	.	.	.	.	.	.	.	.	20	50	.	.	70
2.50 - 2.99	.	.	.	.	.	.	10	10	10	.	.	.	.	30
3.00 - 3.49	.	.	.	.	.	.	.	10	.	10	.	.	.	20
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	10	30	90	100	170	50	180	140	90	120	20	0	

MONTH SEP
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
	PERIOD(SECONDS)													
0.00 - .49	.	.	.	.	.	19	10	38	57	19	19	10	10	182
.50 - .99	.	.	.	.	76	19	10	19	143	29	67	29	.	392
1.00 - 1.49	.	.	.	.	38	38	10	38	48	10	48	48	.	278
1.50 - 1.99	.	.	.	.	29	.	.	.	19	10	19	19	.	96
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	19	19	.	38
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	19	.	.	19
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	0	0	0	143	76	30	95	267	68	191	125	10	

(Continued)

(Sheet 3 of 4)

Table B5 (Concluded)

MONTH OCT
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	.	.	.	.	.	18	18	28	.	28	.	.	92
.50 - .99	.	9	46	83	83	37	46	18	37	9	18	.	.	386
1.00 - 1.49	.	.	9	28	46	28	.	9	28	18	18	.	.	184
1.50 - 1.99	.	.	.	28	46	46	.	.	.	18	18	.	.	156
2.00 - 2.49	.	.	.	.	28	28	9	28	18	18	9	.	.	138
2.50 - 2.99	.	.	.	.	9	9	18	.	.	.	9	.	.	45
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	9	55	139	212	148	91	73	111	63	100	0	0	

MONTH NOV
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	.	11	.	11	.	.	11	.	.	34	.	.	67
.50 - .99	.	.	101	22	67	79	11	.	22	79	22	34	.	437
1.00 - 1.49	.	.	22	11	79	22	.	.	.	11	11	34	.	190
1.50 - 1.99	.	.	.	11	11	.	.	.	.	11	11	11	11	66
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	22	11	.	33
2.50 - 2.99	.	.	.	.	.	11	22	11	.	.	45	11	.	100
3.00 - 3.49	.	.	.	.	.	.	.	11	22	11	22	11	.	77
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	22	.	.	22
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	0	134	44	168	112	33	33	44	112	189	112	11	

MONTH DEC
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	.	.	.	.	.	11	11	11	11	11	.	.	55
.50 - .99	.	.	45	34	135	45	11	56	45	22	11	11	.	415
1.00 - 1.49	.	.	11	124	67	101	22	34	34	11	.	.	.	404
1.50 - 1.99	.	.	.	11	34	11	.	.	.	.	11	.	.	67
2.00 - 2.49	.	.	.	.	.	.	.	.	11	11	22	.	.	44
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	11	.	.	11
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	0	56	169	236	157	44	101	101	55	66	11	0	

(Sheet 4 of 4)

Table B6

1980 Plus 1981 Annual and Seasonal Joint Distribution of Wave Height Versus Peak Period for Gage 625

ANNUAL
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	3	2	4	14	20	34	37	29	9	24	22	1	199
.50 - .99	.	8	33	37	55	42	51	57	59	30	35	22	1	430
1.00 - 1.49	.	.	5	27	43	32	16	14	25	11	26	8	.	207
1.50 - 1.99	.	.	1	7	18	11	4	5	9	8	9	11	1	84
2.00 - 2.49	.	.	.	.	2	3	2	5	3	4	10	9	.	38
2.50 - 2.99	.	.	.	.	1	1	4	2	2	1	6	3	.	20
3.00 - 3.49	.	.	.	.	.	.	.	1	1	1	1	1	.	5
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	1	.	.	1
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	11	41	75	133	109	111	121	128	64	112	76	3	

SEASONAL JAN-MAR
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	4	2	6	12	8	16	16	14	4	22	12	.	116
.50 - .99	.	18	22	38	46	42	38	54	56	12	50	18	.	394
1.00 - 1.49	.	.	6	30	42	24	12	14	52	8	63	12	.	263
1.50 - 1.99	.	.	.	10	16	12	6	12	24	10	16	20	2	128
2.00 - 2.49	.	.	.	.	.	2	2	8	4	2	14	30	.	62
2.50 - 2.99	.	.	.	.	.	2	4	.	2	2	6	10	.	26
3.00 - 3.49	.	.	.	.	.	.	2	.	.	.	.	2	.	4
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	22	30	84	116	90	80	104	152	38	171	104	2	

SEASONAL APR-JUN
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	4	4	12	38	36	78	62	30	8	18	24	.	314
.50 - .99	.	8	40	40	50	42	95	83	68	30	22	20	2	500
1.00 - 1.49	.	.	2	20	24	24	22	12	22	8	6	.	.	140
1.50 - 1.99	.	.	.	6	6	.	4	4	4	6	4	.	.	34
2.00 - 2.49	.	.	.	.	.	2	.	2	2	4	2	.	2	14
2.50 - 2.99	.	.	.	.	.	.	.	.	2	.	.	.	.	2
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	12	46	78	118	104	199	163	128	56	52	44	4	

(Continued)

SEASONAL JUL-SEP
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	7	.	.	2	37	32	62	69	12	17	42	5	285
.50 - .99	.	2	25	30	54	57	37	57	77	37	44	32	5	457
1.00 - 1.49	.	.	.	17	40	35	12	10	12	7	17	12	.	162
1.50 - 1.99	.	.	.	5	10	2	.	5	7	2	10	7	.	48
2.00 - 2.49	.	.	.	.	.	.	.	.	.	5	17	5	.	27
2.50 - 2.99	.	.	.	.	.	.	2	2	2	.	5	.	.	11
3.00 - 3.49	.	.	.	.	.	.	.	2	.	2	.	.	.	4
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	9	25	52	106	131	83	138	167	65	110	98	10	

SEASONAL OCT-DEC
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	.	3	.	5	5	15	17	13	12	35	15	.	120
.50 - .99	.	5	43	40	68	32	35	38	43	40	28	22	.	394
1.00 - 1.49	.	.	10	38	63	45	17	20	15	18	20	8	.	254
1.50 - 1.99	.	.	3	8	35	25	7	.	2	12	8	17	2	119
2.00 - 2.49	.	.	.	.	7	8	5	8	7	7	10	3	.	55
2.50 - 2.99	.	.	.	.	3	3	10	7	3	2	13	2	.	43
3.00 - 3.49	.	.	.	.	.	.	.	2	3	2	3	2	.	12
3.50 - 3.99	.	.	.	.	.	.	.	.	2	.	3	.	.	5
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	5	59	86	181	118	89	92	88	93	120	69	2	

Table B7

1980 Plus 1981 Monthly Joint Distribution of Wave Height

Versus Peak Period for Gage 625

MONTH JAN
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	13	7	13	26	7	26	13	39	.	20	7	.	171
.50 - .99	.	39	46	52	46	52	33	26	26	.	26	.	.	346
1.00 - 1.49	.	.	.	85	78	26	13	13	39	.	20	.	.	274
1.50 - 1.99	.	.	.	7	13	13	7	13	13	20	.	13	.	99
2.00 - 2.49	.	.	.	.	.	7	7	7	13	7	20	33	.	94
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	7	13	.	20
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	52	53	157	163	105	86	72	130	27	93	66	0	

MONTH FEB
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	.	.	6	6	6	6	6	.	6	19	19	.	74
.50 - .99	.	6	6	26	51	26	58	90	77	26	71	6	.	443
1.00 - 1.49	.	.	.	.	32	38	19	26	77	6	38	13	.	249
1.50 - 1.99	.	.	.	26	13	13	6	19	51	13	6	13	.	160
2.00 - 2.49	.	.	.	.	.	.	.	19	.	.	13	32	.	64
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	6	.	.	6
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	6	6	58	102	83	89	160	205	51	153	83	0	

MONTH MAR
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	.	.	.	5	11	16	27	5	5	27	11	.	107
.50 - .99	.	11	16	37	43	48	27	48	64	11	53	43	.	401
1.00 - 1.49	.	.	16	11	21	11	5	5	43	16	118	21	.	267
1.50 - 1.99	.	.	.	.	21	11	5	5	11	.	37	32	5	127
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	11	27	.	38
2.50 - 2.99	.	.	.	.	.	5	11	.	5	5	5	16	.	47
3.00 - 3.49	.	.	.	.	.	.	5	.	.	.	.	5	.	10
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	11	32	48	90	86	69	85	128	37	251	155	5	

(Sheet 1 of 4)

(Continued)

Table B7 (Continued)

MONTH APR
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS)													TOTAL
	1.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 10.9	11.0- 11.9	12.0- 13.9	14.0- 16.9	17.0- LONGER	
0.00 - .49	.	7	.	7	13	34	47	27	27	13	20	40	.	235
.50 - .99	.	.	13	27	40	27	81	101	121	94	13	47	7	571
1.00 - 1.49	.	.	7	13	34	20	7	7	13	27	.	.	.	128
1.50 - 1.99	.	.	.	.	7	.	.	.	7	20	13	.	.	47
2.00 - 2.49	.	.	.	.	.	.	.	.	7	13	.	.	.	20
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	7	20	47	94	81	135	135	175	167	46	87	7	

MONTH MAY
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS)													TOTAL
	1.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 10.9	11.0- 11.9	12.0- 13.9	14.0- 16.9	17.0- LONGER	
0.00 - .49	.	.	5	5	24	24	68	63	29	10	24	19	.	271
.50 - .99	.	10	39	49	78	49	87	39	39	5	44	10	.	449
1.00 - 1.49	.	.	.	29	29	39	44	19	39	.	15	.	.	214
1.50 - 1.99	.	.	.	15	5	.	10	10	5	.	.	.	.	45
2.00 - 2.49	.	.	.	.	.	5	.	5	.	.	5	.	5	20
2.50 - 2.99	.	.	.	.	.	.	.	.	5	.	.	.	.	5
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	10	44	98	136	117	209	136	117	15	88	29	5	

MONTH JUN
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS)													TOTAL
	1.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 10.9	11.0- 11.9	12.0- 13.9	14.0- 16.9	17.0- LONGER	
0.00 - .49	.	7	7	27	81	54	122	95	34	.	7	14	.	448
.50 - .99	.	14	68	41	20	47	122	128	54	.	.	7	.	501
1.00 - 1.49	.	.	.	14	7	7	7	7	7	.	.	.	.	49
1.50 - 1.99	.	.	.	.	7	.	.	.	.	.	.	.	.	7
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	21	75	82	115	108	251	230	95	0	7	21	0	

(Continued)

MONTH JUL
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	21	.	.	.	63	83	42	42	21	21	83	.	376
.50 - .99	.	.	42	63	63	104	83	63	42	21	.	21	.	502
1.00 - 1.49	.	.	.	10	52	31	21	.	.	.	.	.	.	114
1.50 - 1.99	.	.	.	.	.	10	.	.	.	.	.	.	.	10
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	21	42	73	115	208	187	105	84	42	21	104	0	

MONTH AUG
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	6	.	.	6	45	26	103	116	6	6	45	.	359
.50 - .99	.	6	32	26	45	71	19	52	39	32	32	26	13	393
1.00 - 1.49	.	.	.	32	26	39	13	.	.	13	.	.	.	123
1.50 - 1.99	.	.	.	13	6	.	.	.	6	.	13	6	.	44
2.00 - 2.49	.	.	.	.	.	.	.	.	.	13	32	.	.	45
2.50 - 2.99	.	.	.	.	.	.	6	6	6	.	.	.	.	18
3.00 - 3.49	.	.	.	.	.	.	.	6	.	6	.	.	.	12
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	12	32	71	83	155	64	167	167	70	83	77	13	

MONTH SEP
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	.	.	.	.	13	6	32	39	13	26	13	13	155
.50 - .99	.	.	6	13	58	13	26	58	136	52	84	45	.	491
1.00 - 1.49	.	.	.	6	45	32	6	26	32	6	45	32	.	230
1.50 - 1.99	.	.	.	.	19	.	.	13	13	6	13	13	.	77
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	13	13	.	26
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	13	.	.	13
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	0	6	19	122	58	38	129	220	77	194	116	13	

(Continued)

(Sheet 3 of 4)

Table B7 (Concluded)

MONTH OCT
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	.	.	.	.	.	27	27	14	9	27	9	.	113
.50 - .99	.	5	27	45	59	18	45	59	68	23	32	23	.	404
1.00 - 1.49	.	.	5	36	55	18	5	18	23	27	27	5	.	219
1.50 - 1.99	.	.	9	14	36	23	9	.	.	23	9	.	.	123
2.00 - 2.49	.	.	.	.	18	18	9	14	14	9	9	.	.	91
2.50 - 2.99	.	.	.	.	9	5	18	5	5	.	5	.	.	47
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	5	.	.	.	.	5
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	5	41	95	177	82	113	123	129	91	109	37	0	

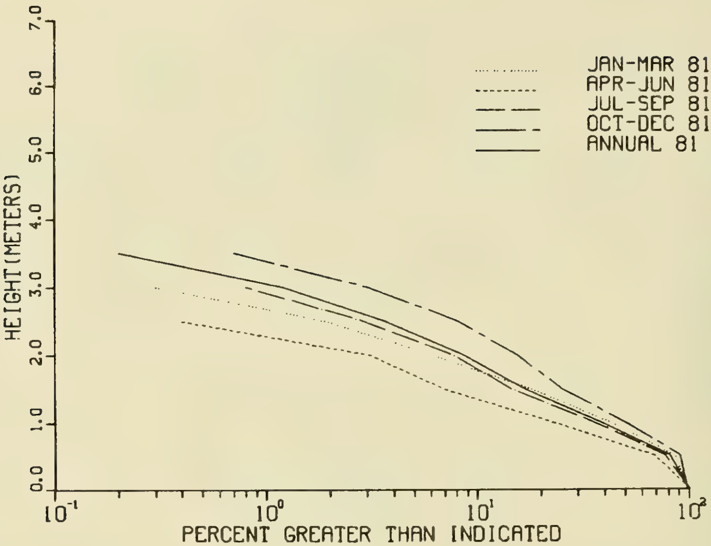
MONTH NOV
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	.	10	.	5	10	10	14	14	5	48	19	.	135
.50 - .99	.	10	58	34	58	43	29	14	19	63	29	34	.	391
1.00 - 1.49	.	.	14	10	72	43	19	14	.	10	19	19	.	220
1.50 - 1.99	.	.	.	5	34	29	5	.	.	5	10	48	5	141
2.00 - 2.49	.	.	.	.	.	.	5	.	.	.	10	10	.	25
2.50 - 2.99	.	.	.	.	.	5	10	5	.	.	19	5	.	44
3.00 - 3.49	.	.	.	.	.	.	.	5	10	5	10	5	.	35
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	10	.	.	10
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	10	82	49	169	130	78	52	43	88	155	140	5	

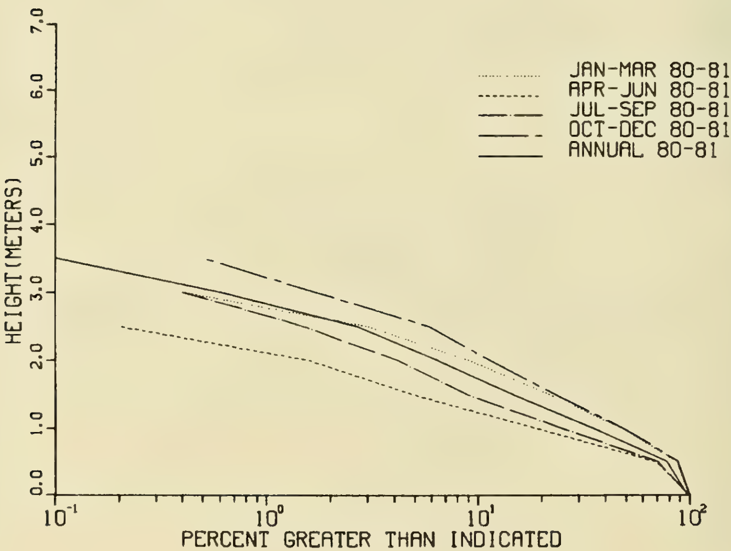
MONTH DEC
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	.	.	.	11	6	6	6	11	23	29	17	.	109
.50 - .99	.	.	46	40	91	34	29	40	40	34	23	6	.	383
1.00 - 1.49	.	.	11	74	63	80	29	29	23	17	11	.	.	337
1.50 - 1.99	.	.	.	6	34	23	6	.	6	6	6	.	.	87
2.00 - 2.49	.	.	.	.	.	6	.	11	6	11	11	.	.	45
2.50 - 2.99	.	.	.	.	.	.	.	11	6	6	17	.	.	40
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	0	57	120	199	149	70	97	92	97	97	23	0	

(Sheet 4 of 4)

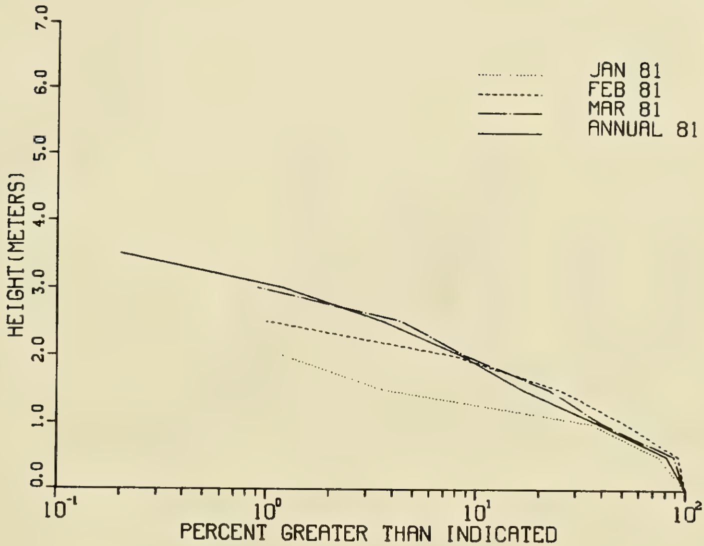


a. 1981



b. 1980 plus 1981

Figure B5. Seasonal and annual cumulative distribution of wave height for gage 625



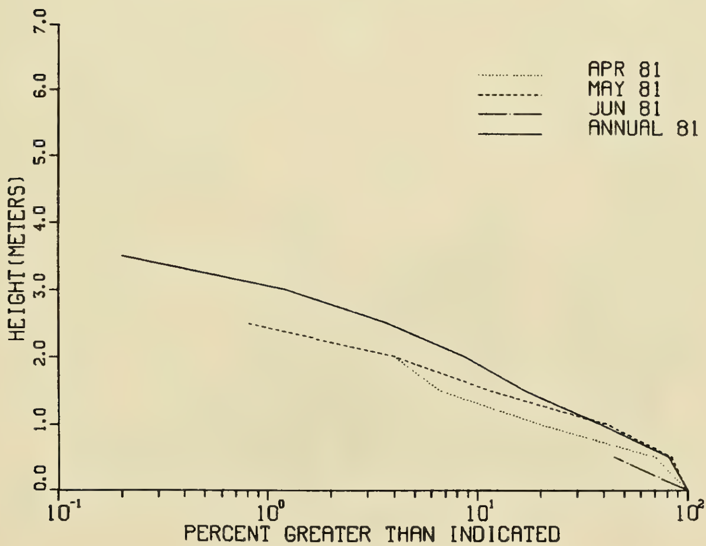
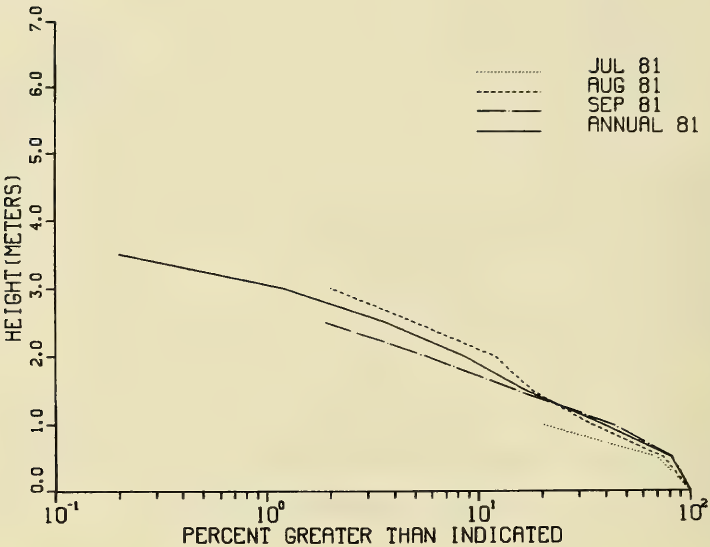


Figure B6. 1981 monthly cumulative distribution of wave height for gage 625 (Continued)



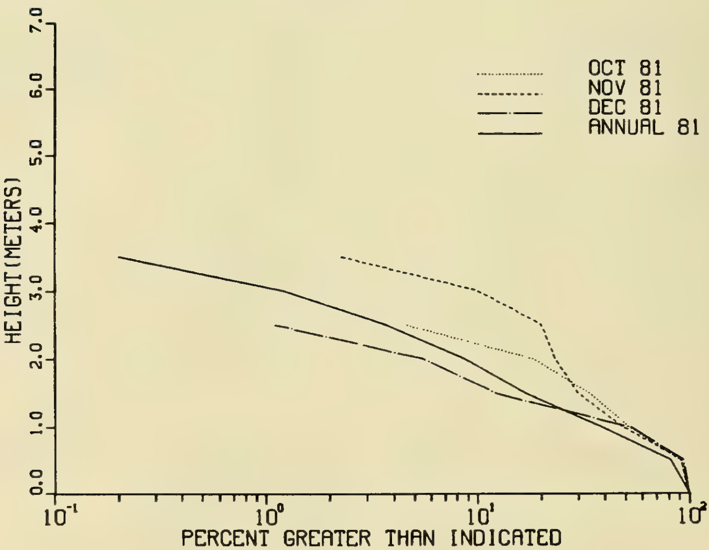
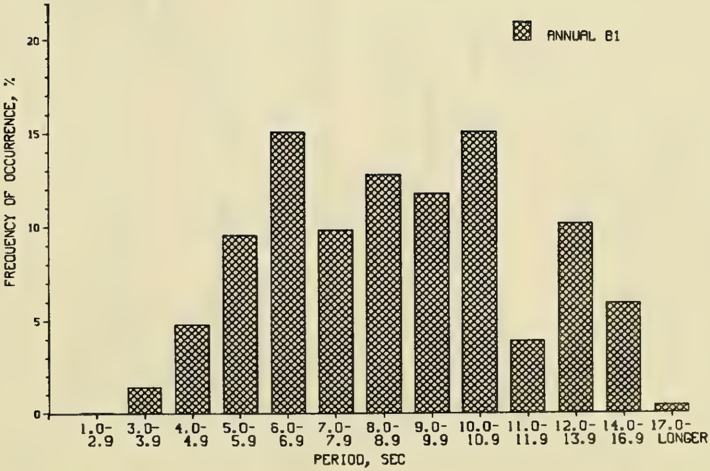
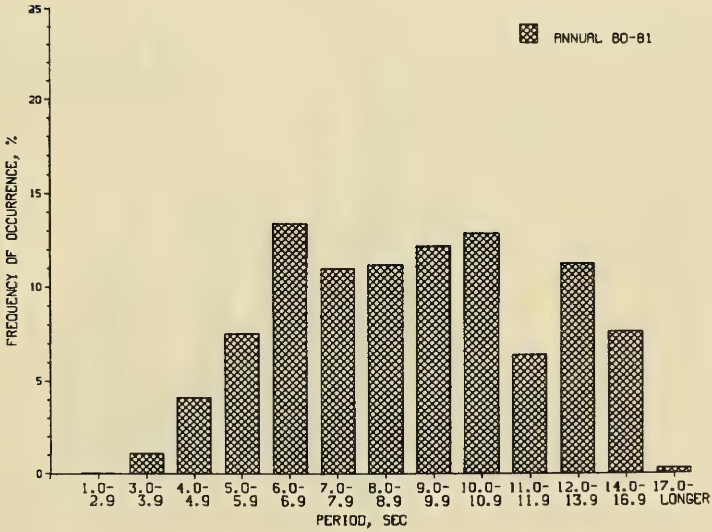


Figure B6. (Concluded)

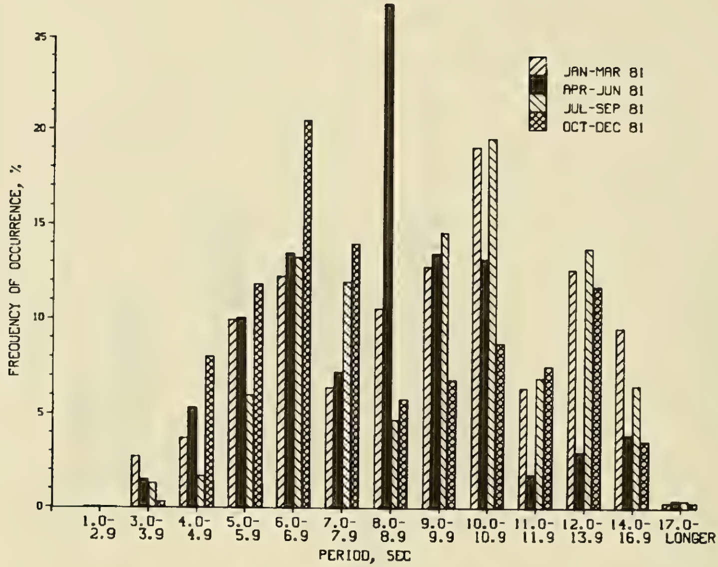


a. 1981

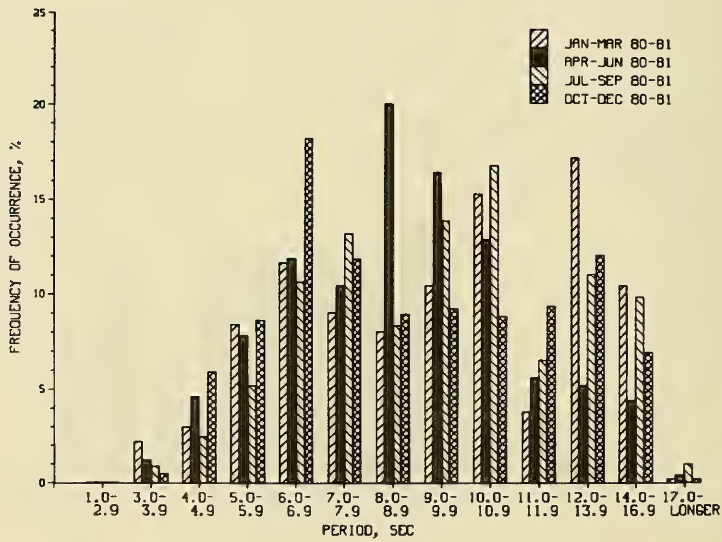


b. 1980 plus 1981

Figure B7. Annual peak spectral wave period distribution for gage 625

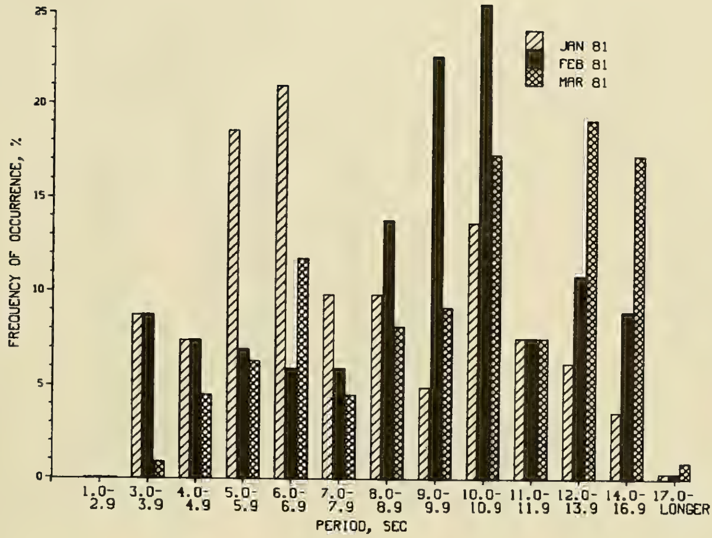


a. 1981



b. 1980 plus 1981

Figure B8. Seasonal peak spectral wave period distribution for gage 625



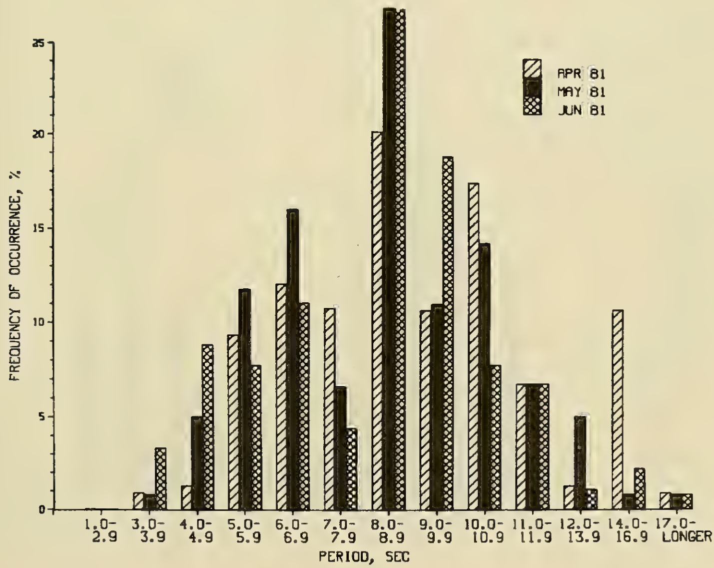
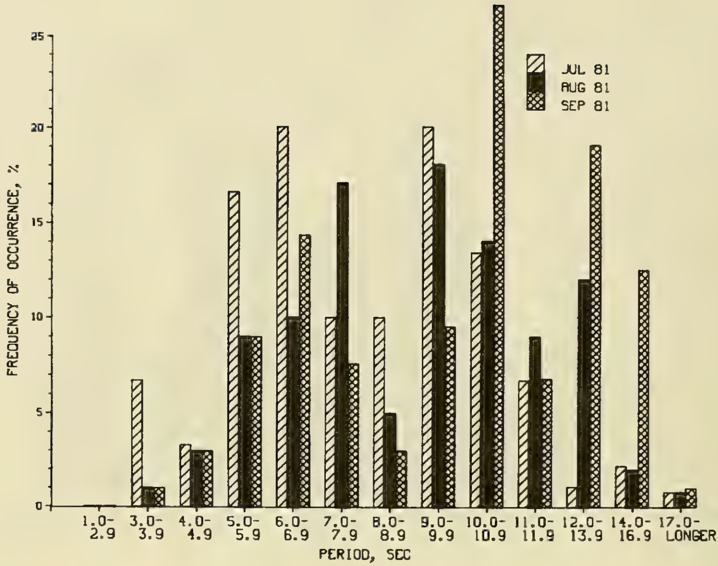


Figure B9. 1981 monthly peak spectral wave period distribution for gage 625 (Continued)



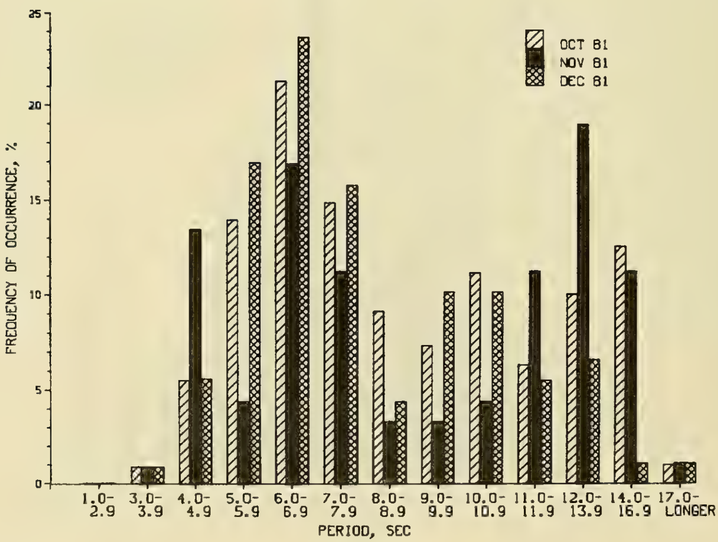


Figure B9. (Concluded)

Table B8

Persistence of 1981 Wave Heights for Gage 625

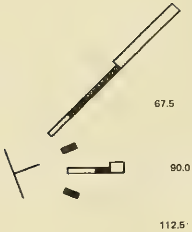
Height, m	Consecutive Day(s) or Longer																											
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	33	34	55
0.5	26	25	20	17	15	13	12	11	9	8						7	6				5					4	3	1
1.0	41	31	23	19	13	11	9	7	5		1																	
1.5	30	19	11	7	6	3	1																					
2.0	16	11	5	3	2																							
2.5	12	5		1																								
3.0	3			1																								
3.5		1																										
4.0																												

Table B9

Persistence of 1980 Plus 1981 Wave Heights for Gage 625

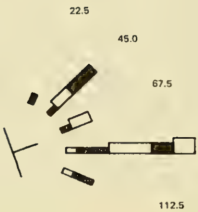
Height	Consecutive Day(s)																								
Height, m	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1.0	42	30	21	15	10		9	7	5	3	2														
1.5	29	17	9	7	6	3	1																		
2.0	16	9	5	3	2																				
2.5	10	4		1																					
3.0	3			1																					
3.5		1																							
4.0																									

Figure B10. 1980 plus 1981 annual and seasonal wave roses for gage 625



JAN

RESULTANT
HEIGHT 0.7m
DIRECTION 54 DEG



FEB

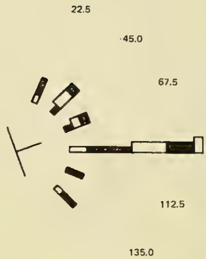
RESULTANT
HEIGHT 1.0m
DIRECTION 77 DEG

MAR

RESULTANT
HEIGHT 1.0m
DIRECTION 62 DEG

APR

RESULTANT
HEIGHT 0.5m
DIRECTION 71 DEG



MAY

RESULTANT
HEIGHT 0.9m
DIRECTION 78 DEG

JUN

RESULTANT
HEIGHT 0.4m
DIRECTION 85 DEG

Figure B11. 1981 monthly wave roses for gage 625 (Continued)

JUL

RESULTANT
HEIGHT 0.4m
DIRECTION 71 DEG

OCT

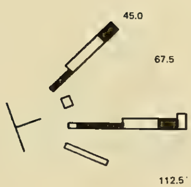
RESULTANT
HEIGHT 1.1m
DIRECTION 63 DEG

AUG

RESULTANT
HEIGHT 0.8m
DIRECTION 68 DEG

NOV

RESULTANT
HEIGHT 1.3m
DIRECTION 58 DEG



SEP

RESULTANT
HEIGHT 0.8m
DIRECTION 72 DEG

DEC

RESULTANT
HEIGHT 0.9m
DIRECTION 61 DEG

Figure B11. (Concluded)

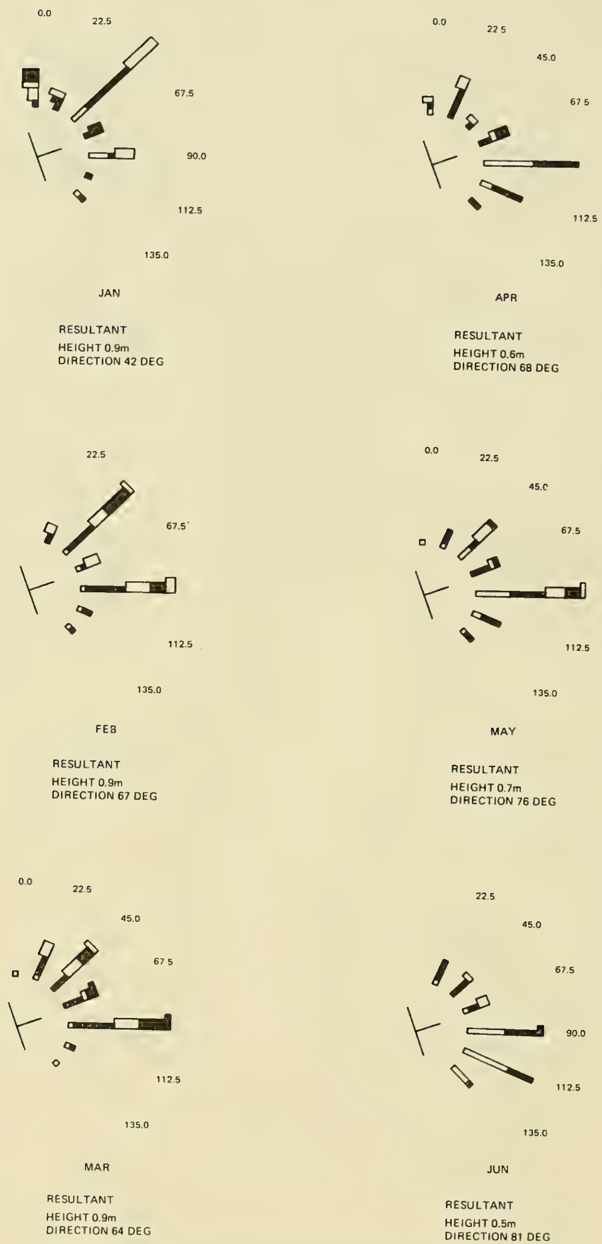


Figure B12. 1980 plus 1981 monthly wave roses for gage 625 (Continued)

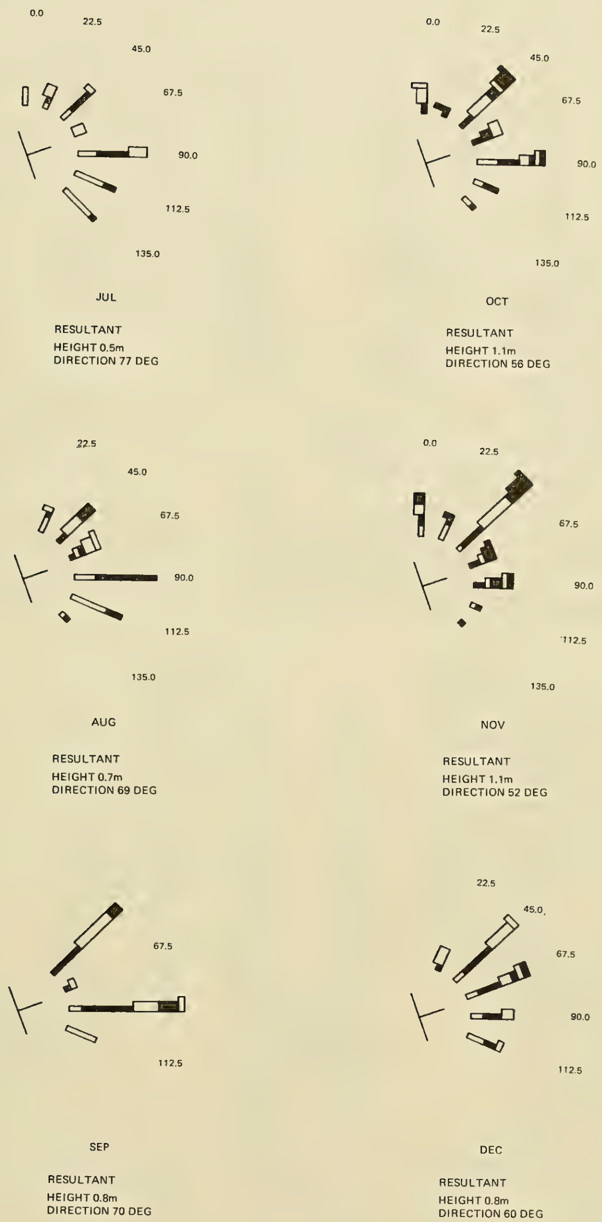


Figure B12. (Concluded)

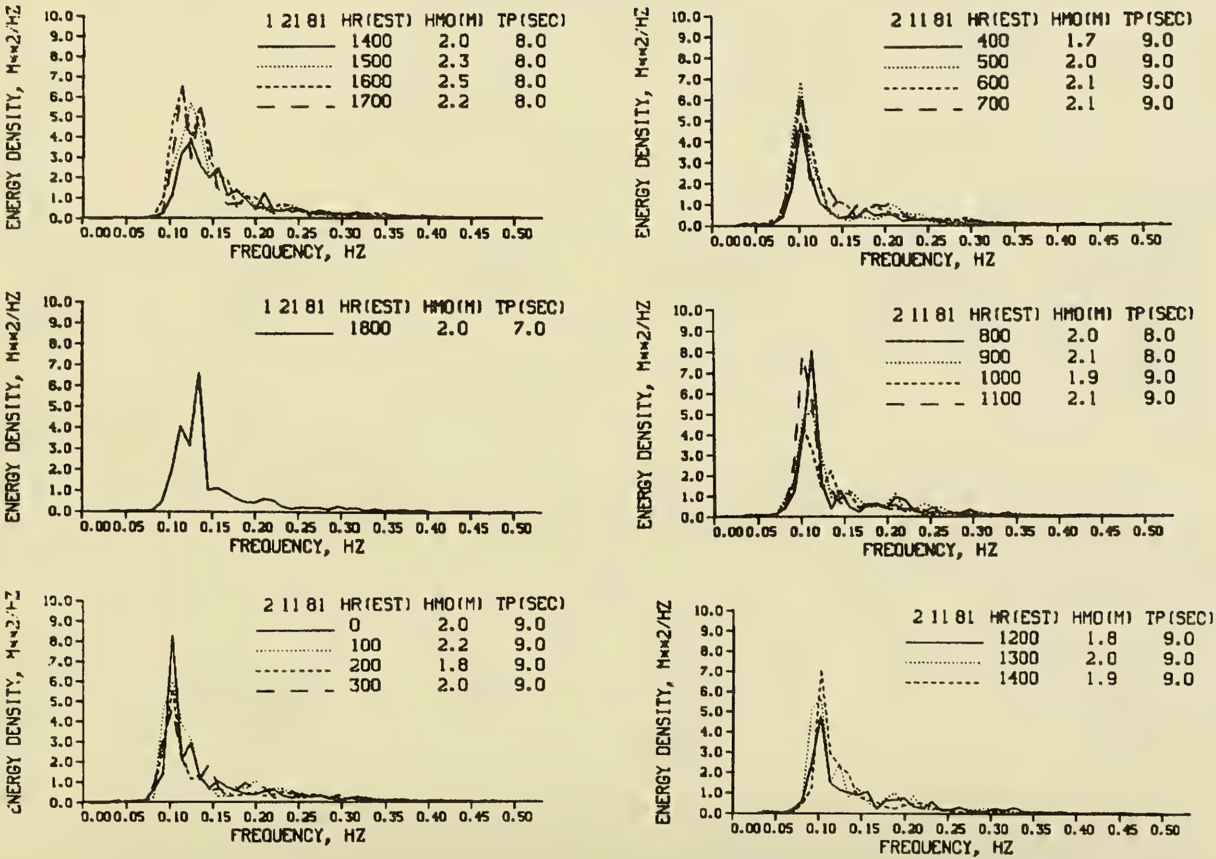


Figure B13. 1981 wave spectra for wave heights > 2 m at gage 625 in consecutive order (date and time of measurement are noted in key (Sheet 1 of 27))

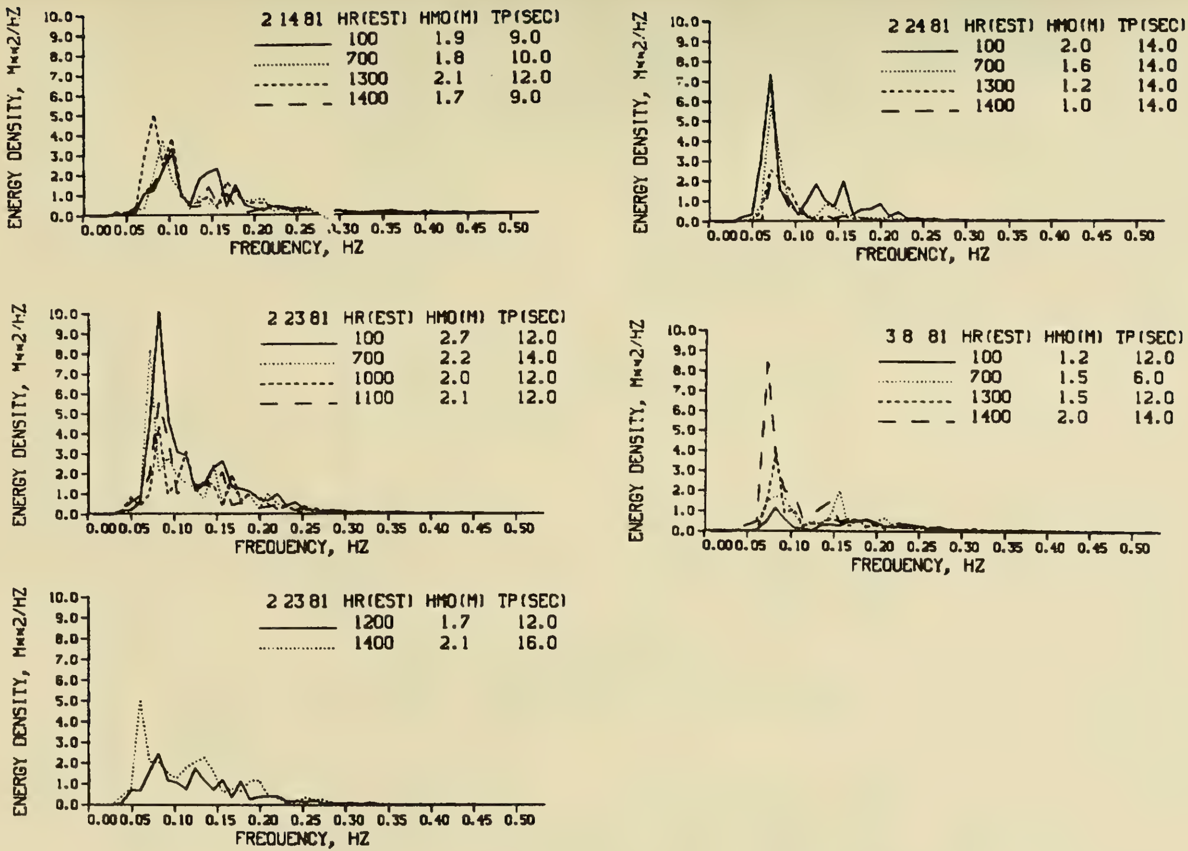


Figure B13. (Sheet 2 of 27)

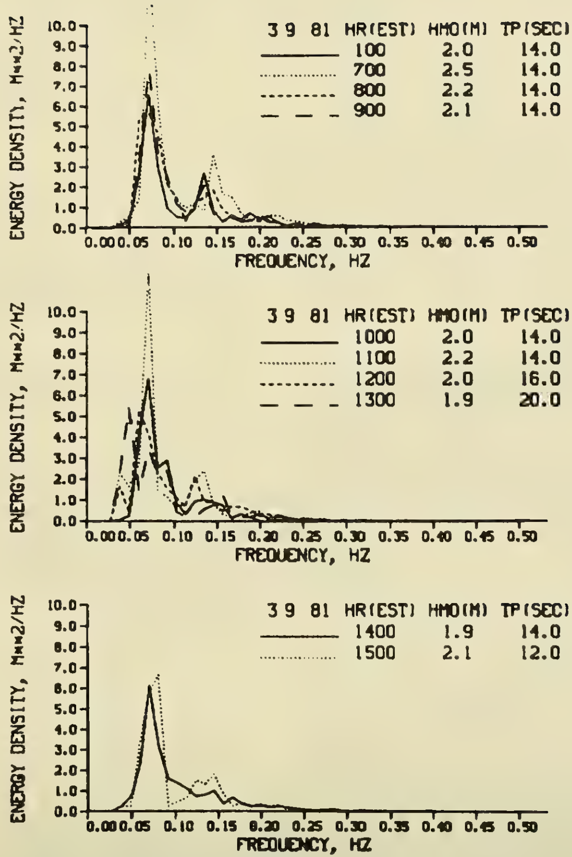


Figure B13. (Sheet 3 of 27)

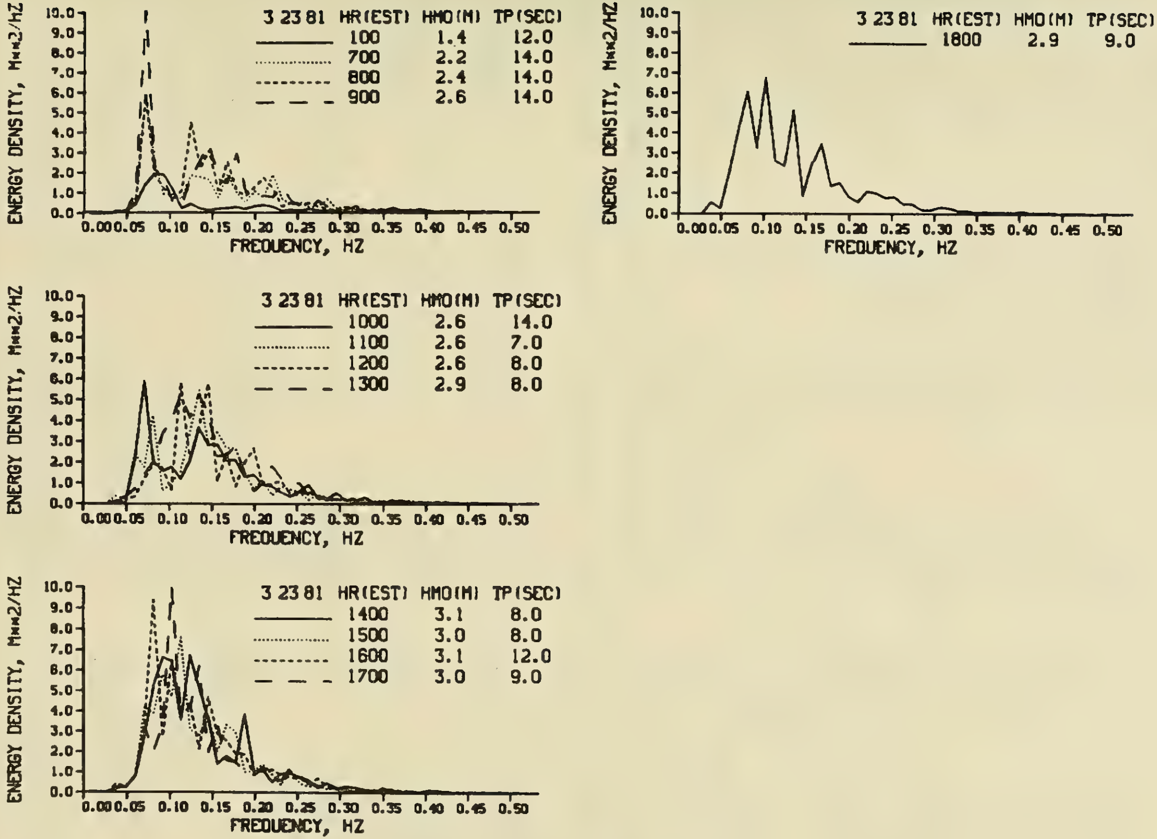


Figure B13. (Sheet 4 of 27)

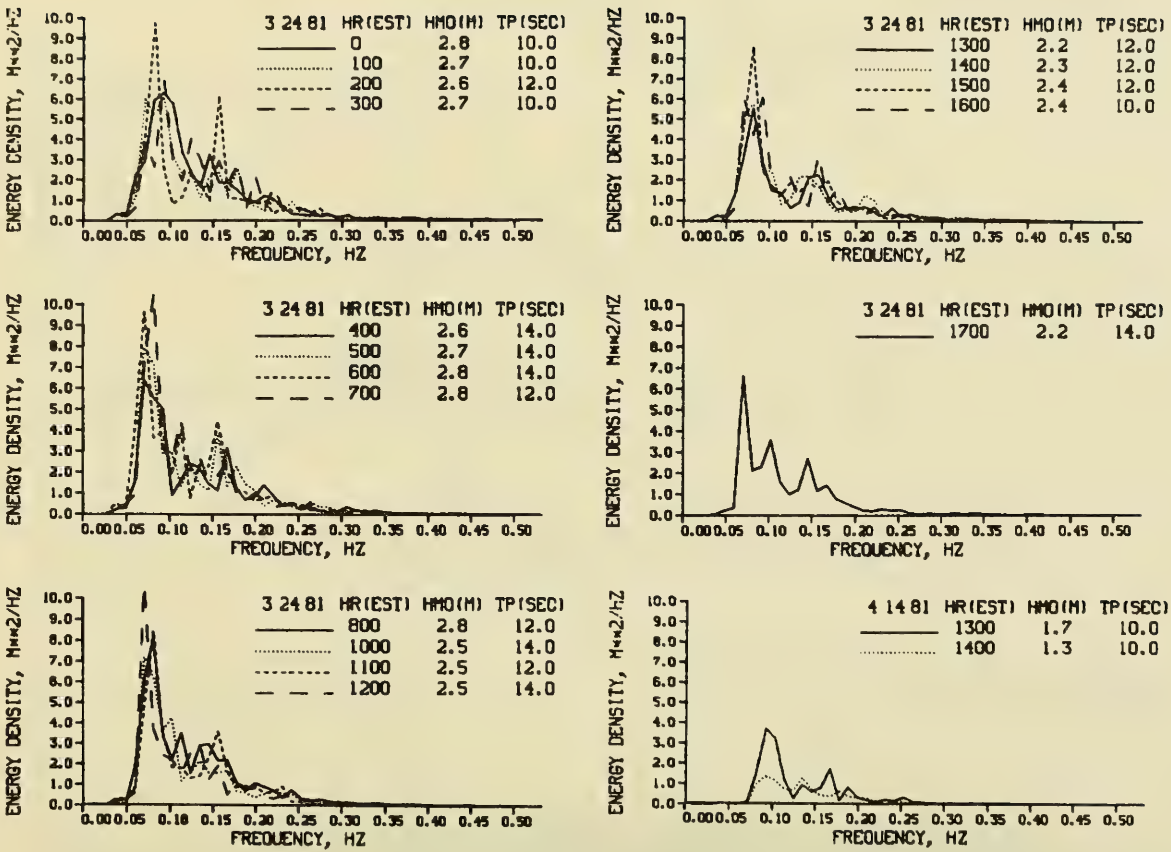


Figure B13. (Sheet 5 of 27)

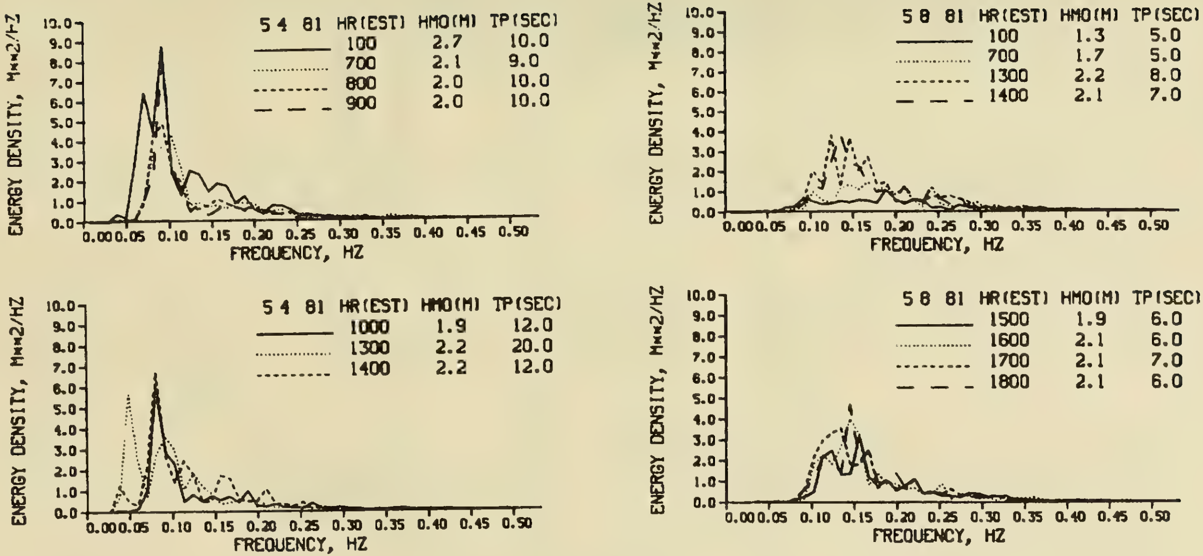


Figure B13. (Sheet 6 of 27)

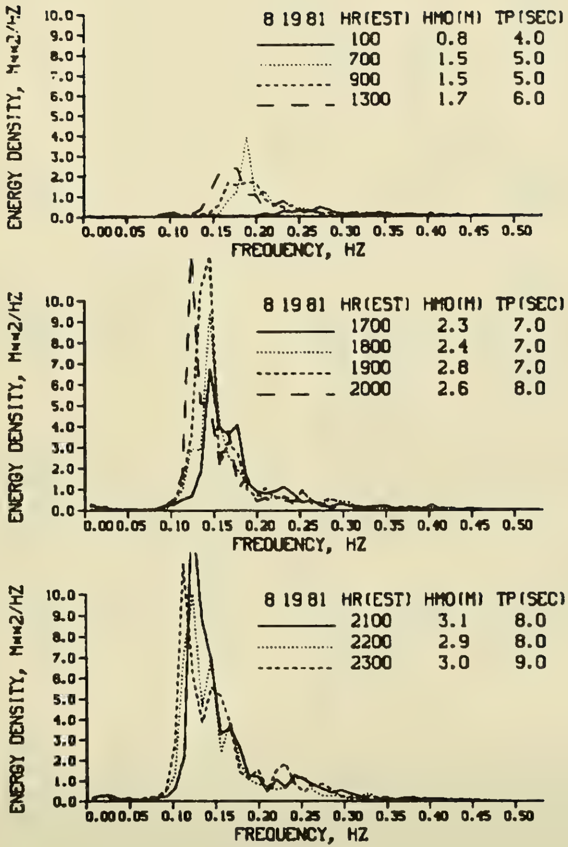


Figure B13. (Sheet 7 of 27)

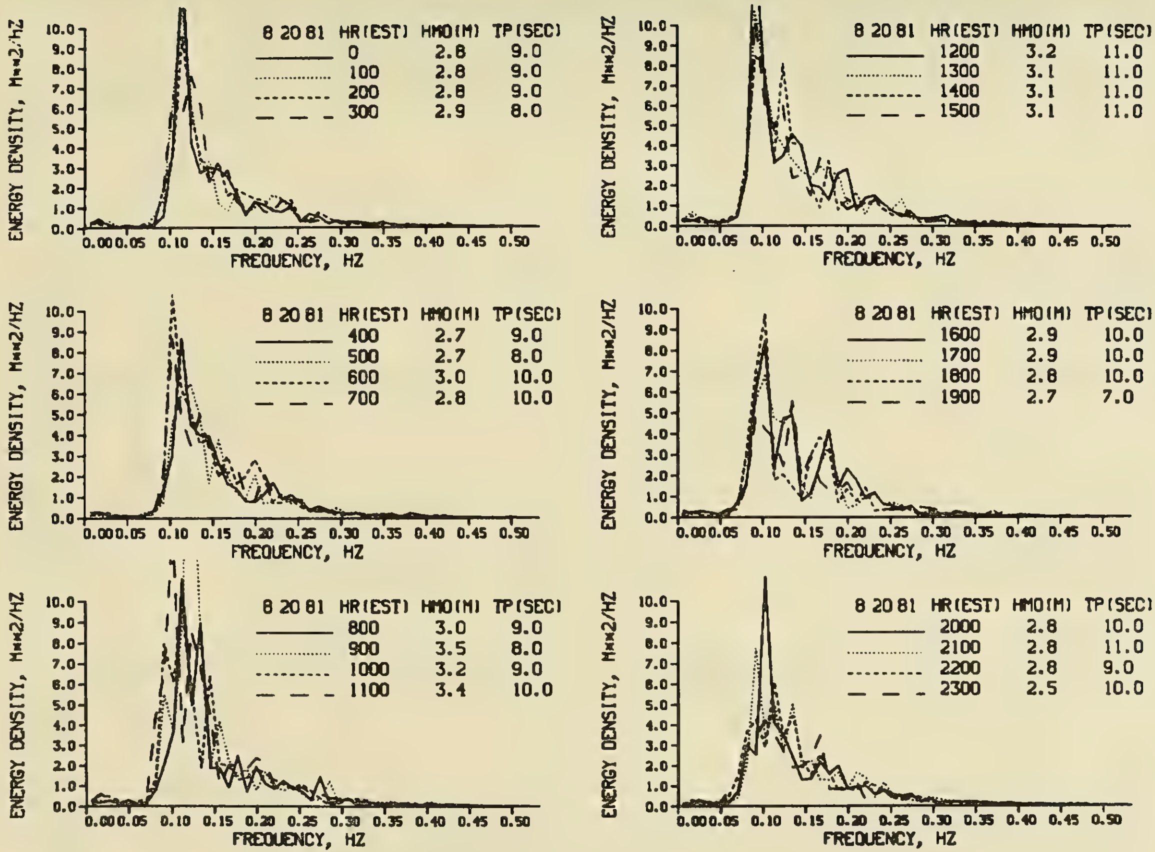


Figure B13. (Sheet 8 of 27)

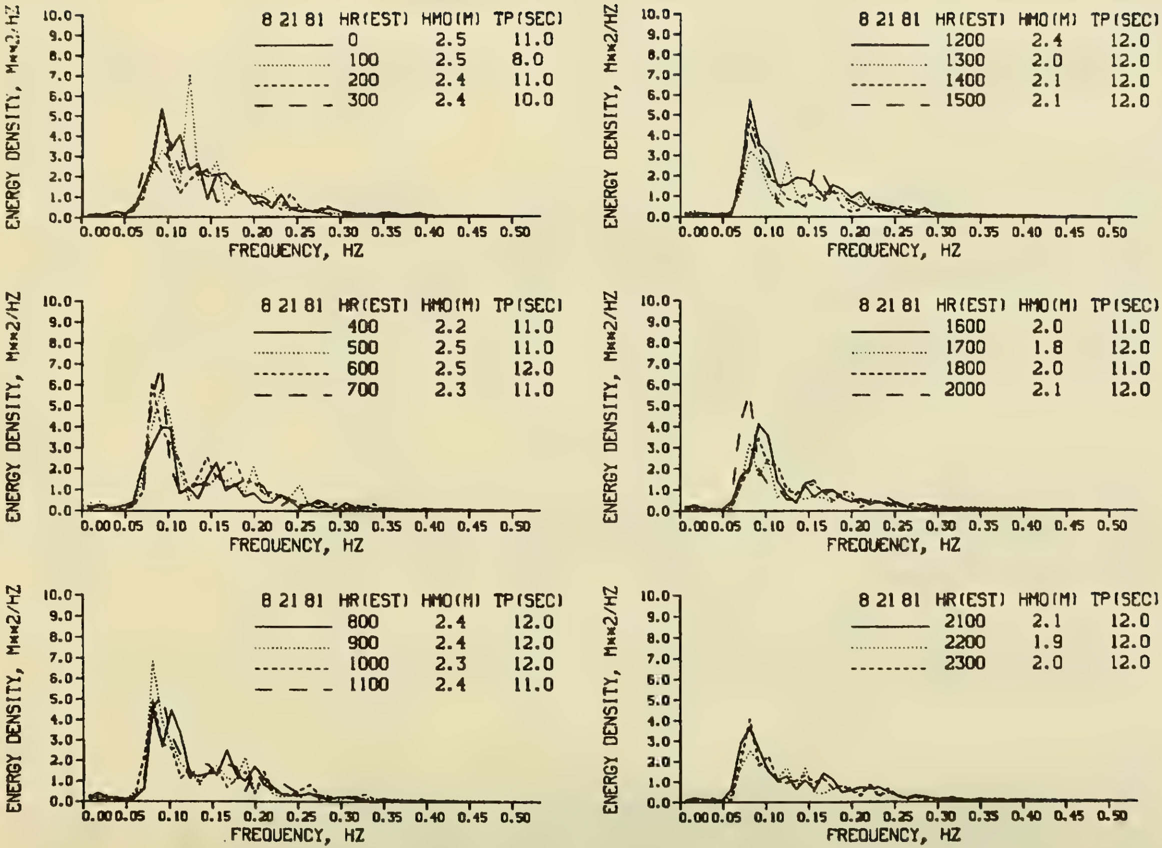


Figure B13. (Sheet 9 of 27)

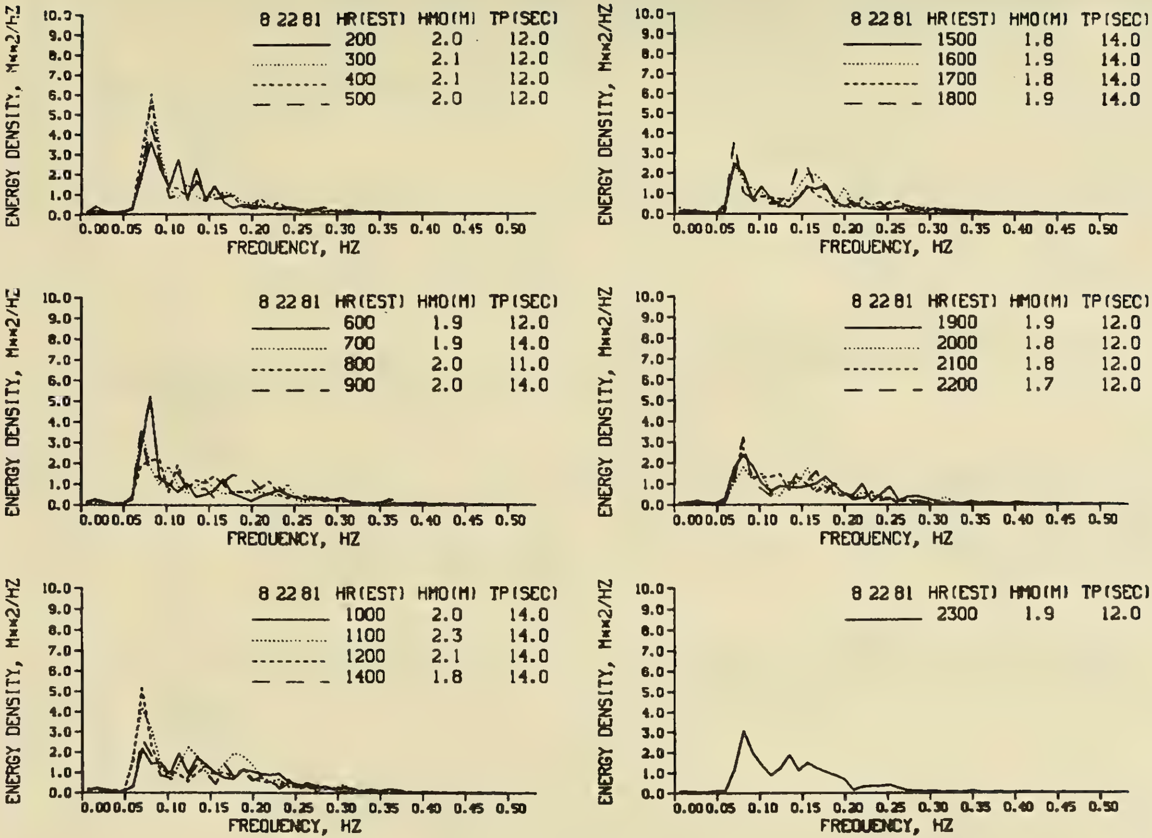


Figure B13. (Sheet 10 of 27)

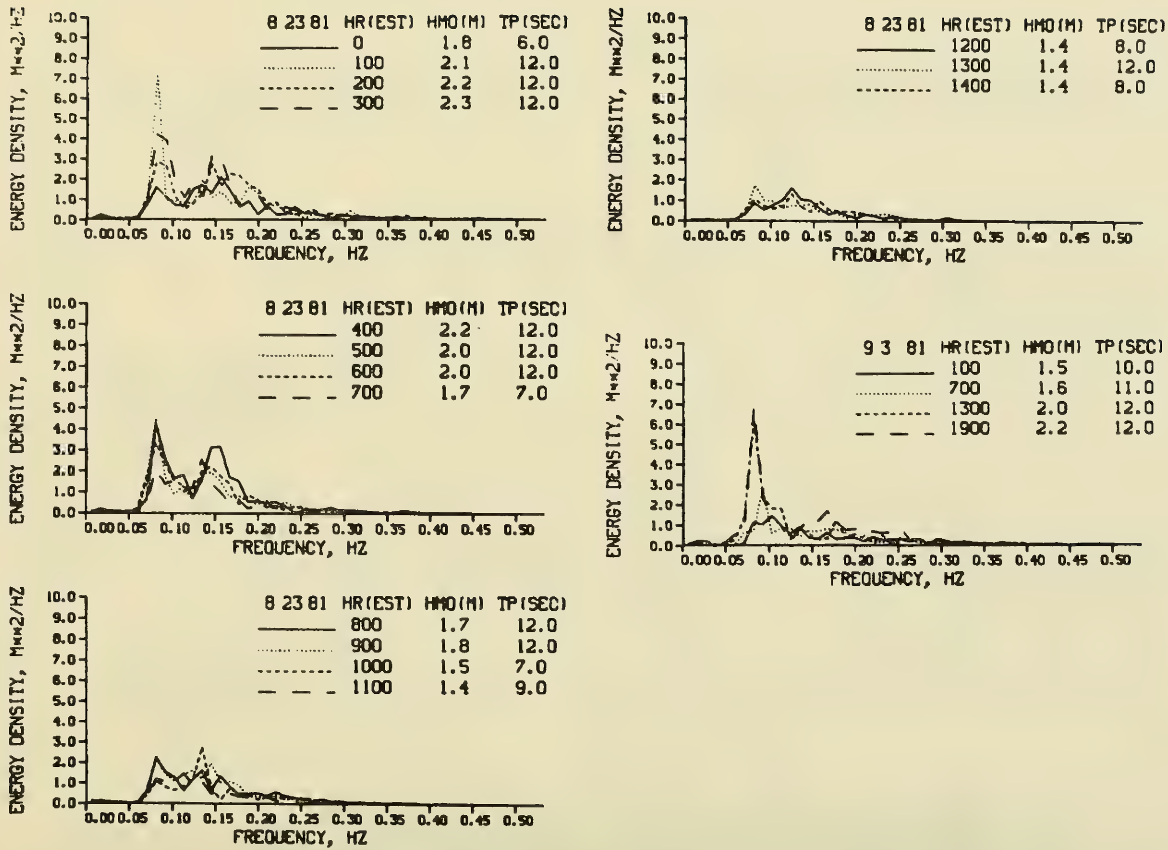


Figure B13. (Sheet 11 of 27)

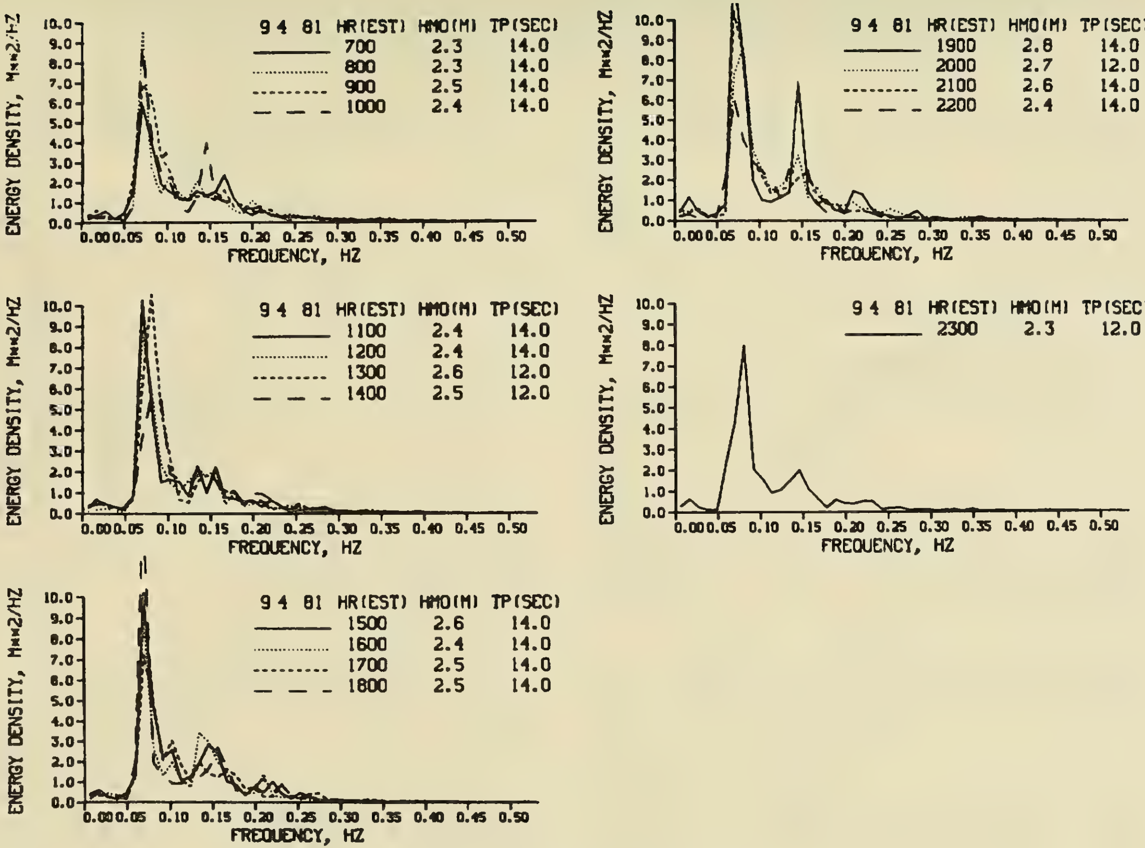


Figure B13. (Sheet 12 of 27)

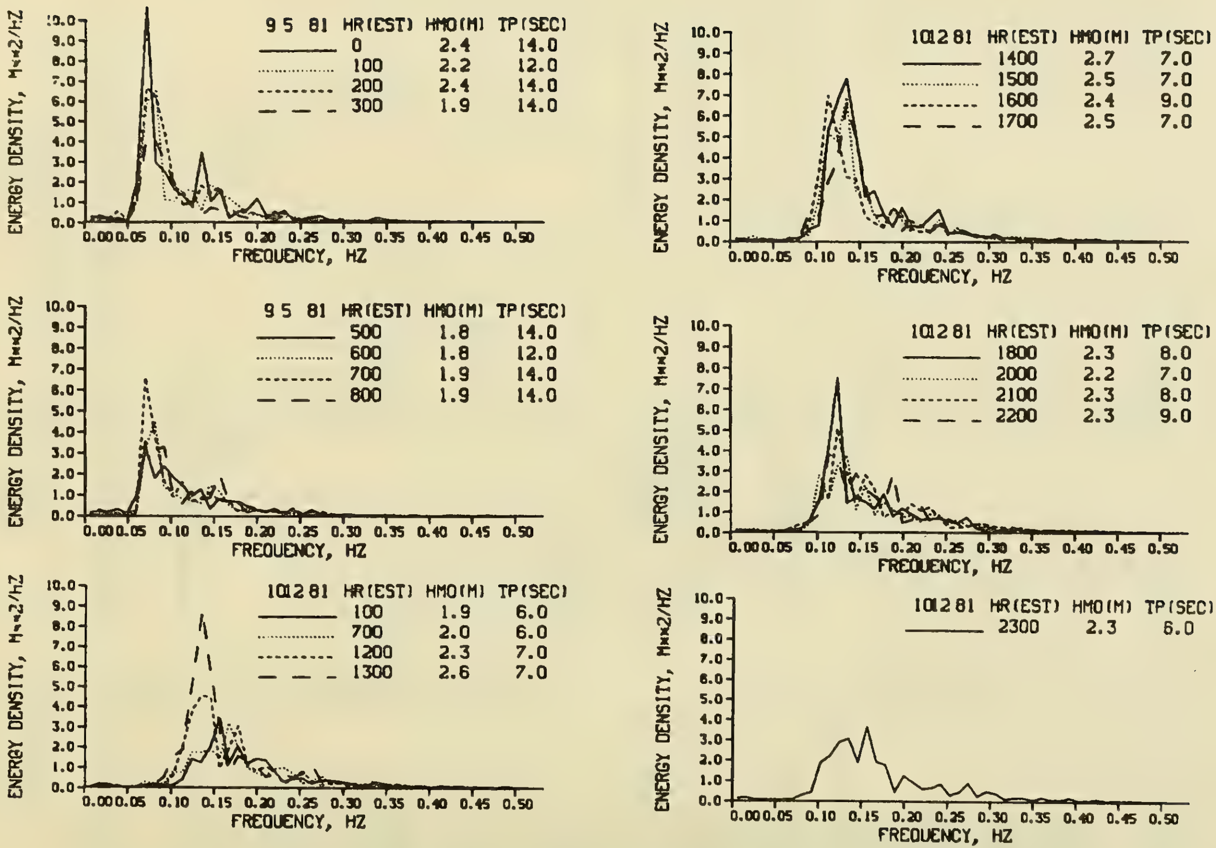


Figure B13. (Sheet 13 of 27)

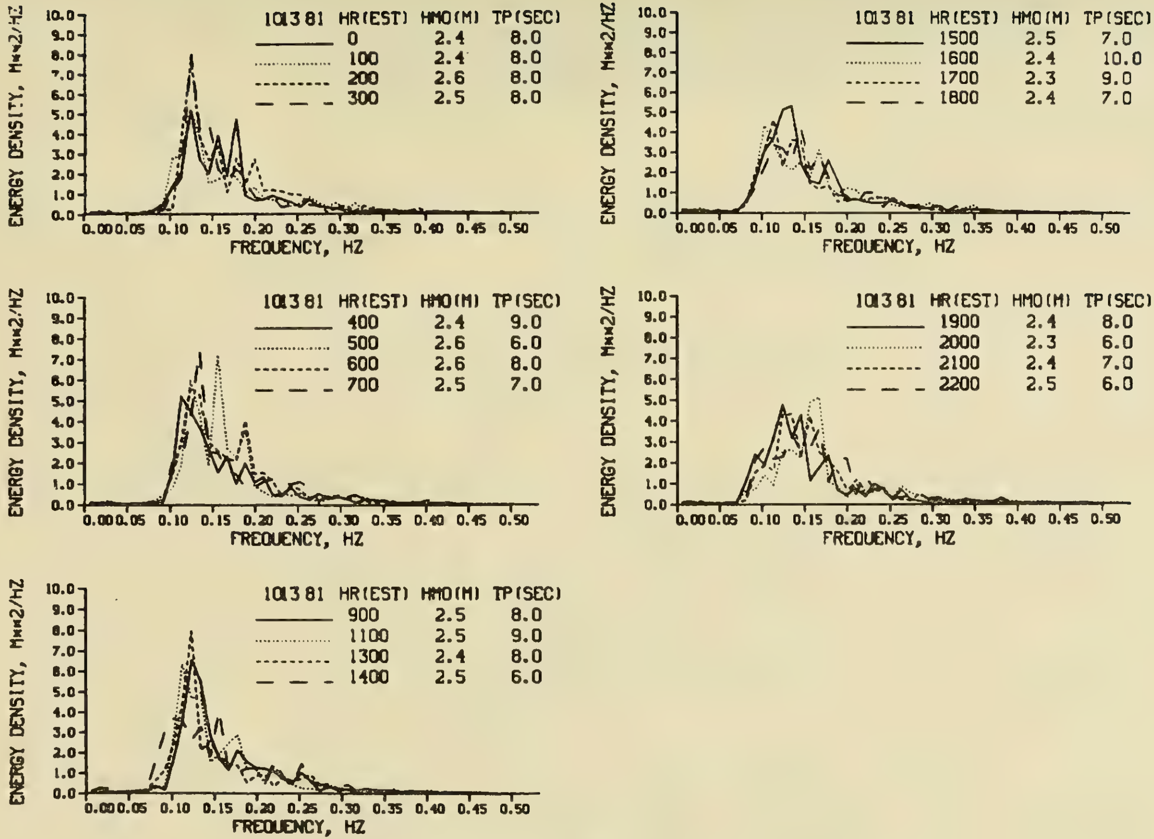


Figure B13. (Sheet 14 of 27)

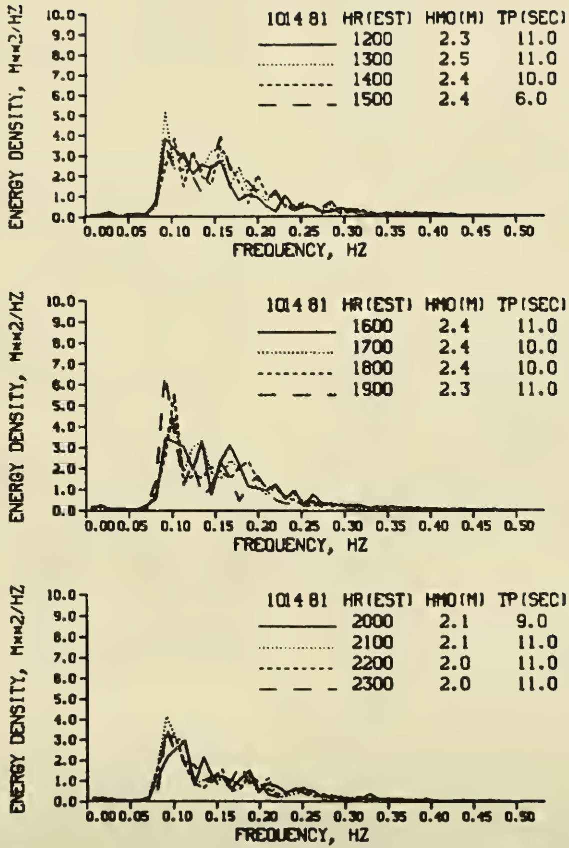


Figure B13. (Sheet 15 of 27)

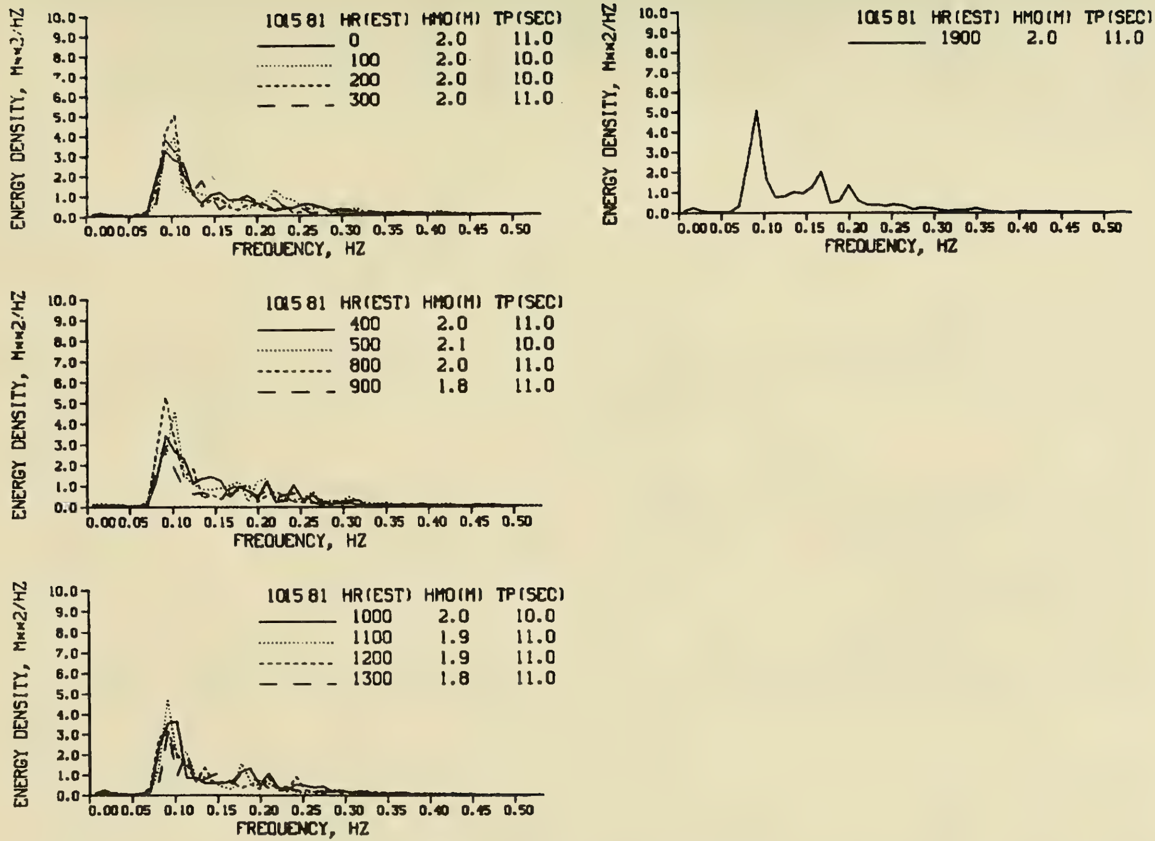


Figure B13. (Sheet 16 of 27)

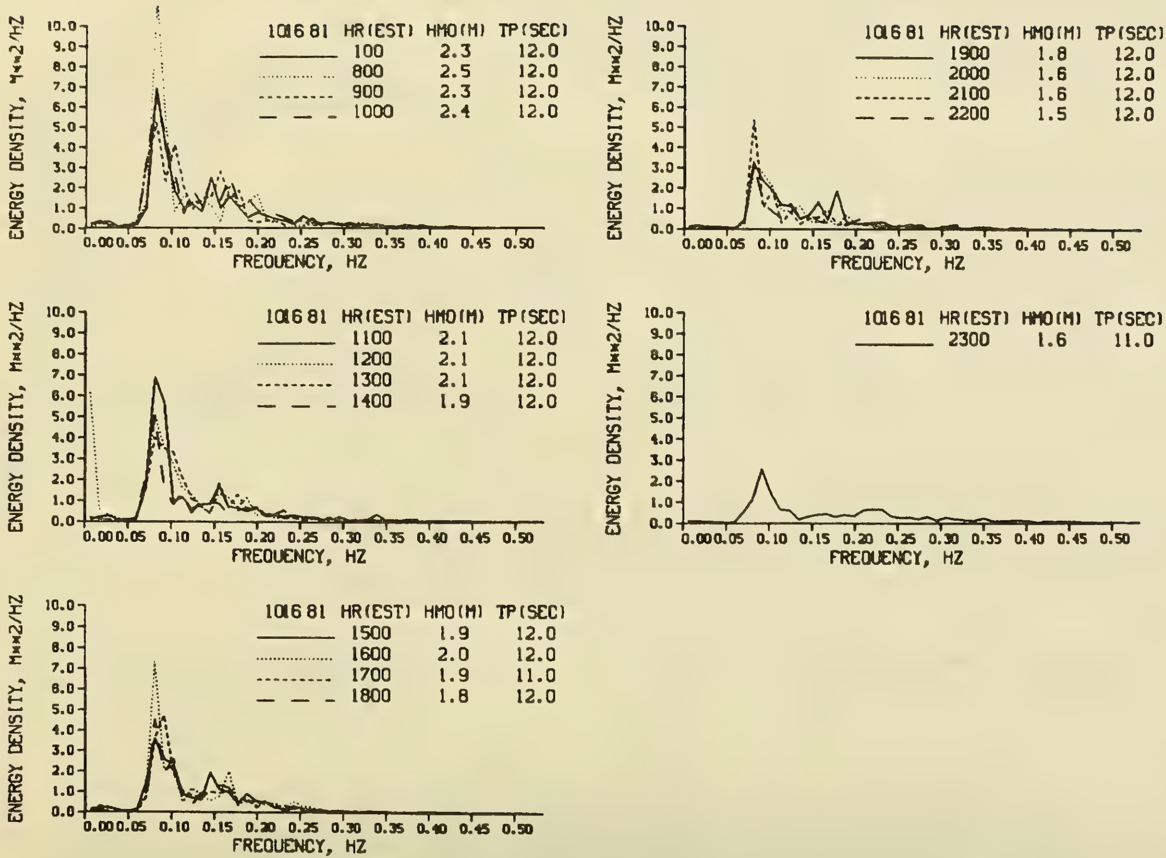


Figure B13. (Sheet 17 of 27)

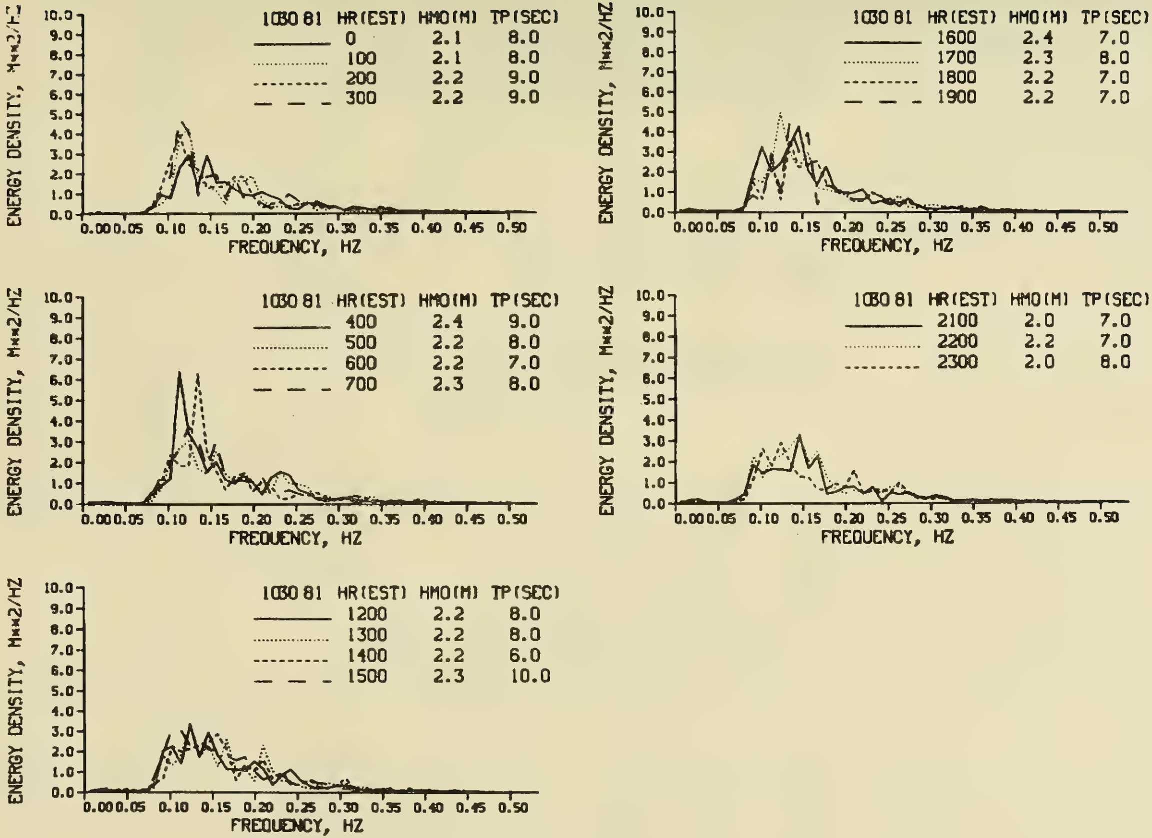


Figure B13. (Sheet 18 of 27)

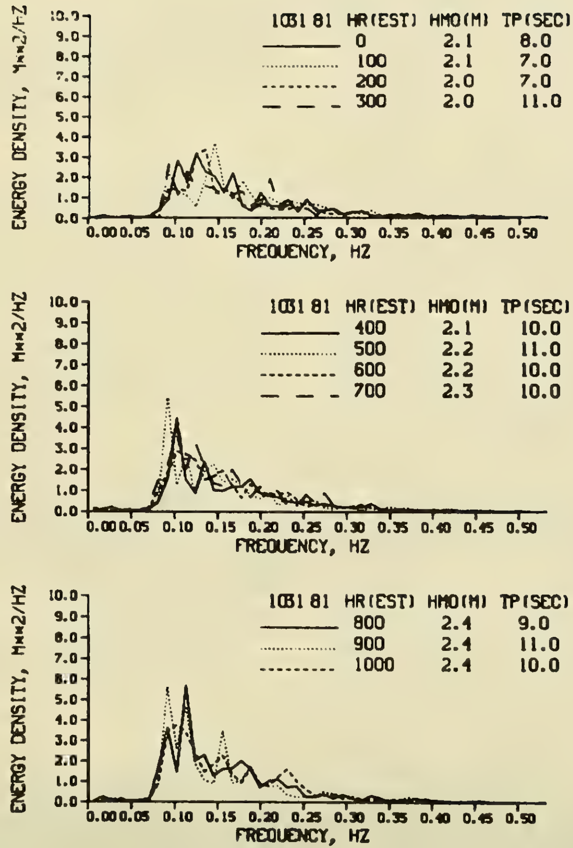


Figure B13. (Sheet 19 of 27)

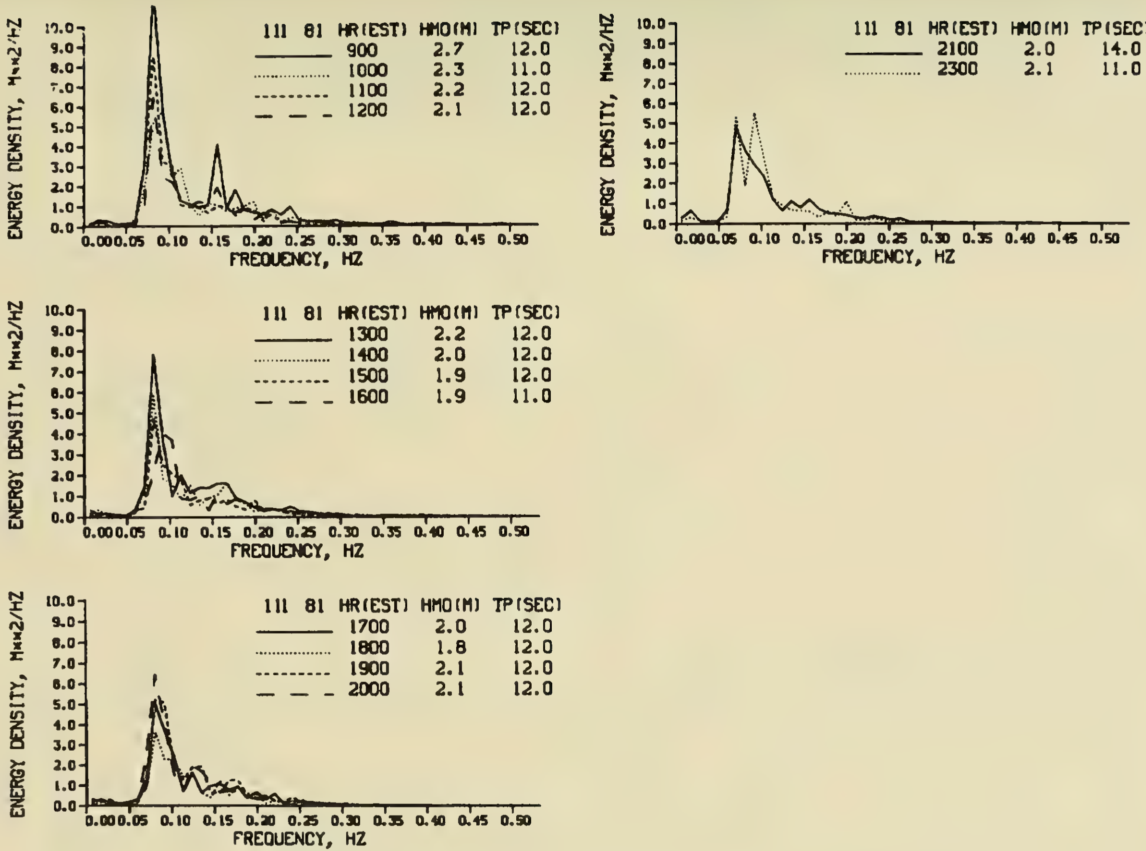


Figure B13. (Sheet 20 of 27)

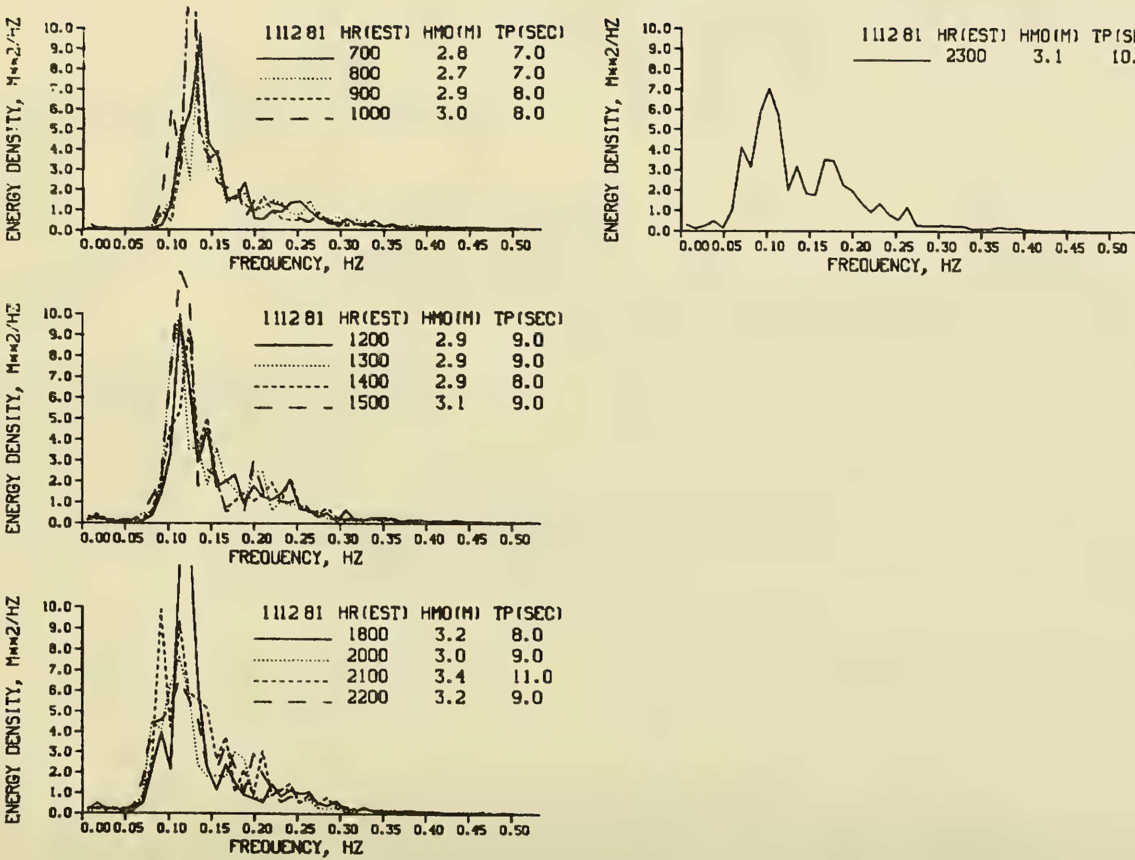


Figure B13. (Sheet 21 of 27)

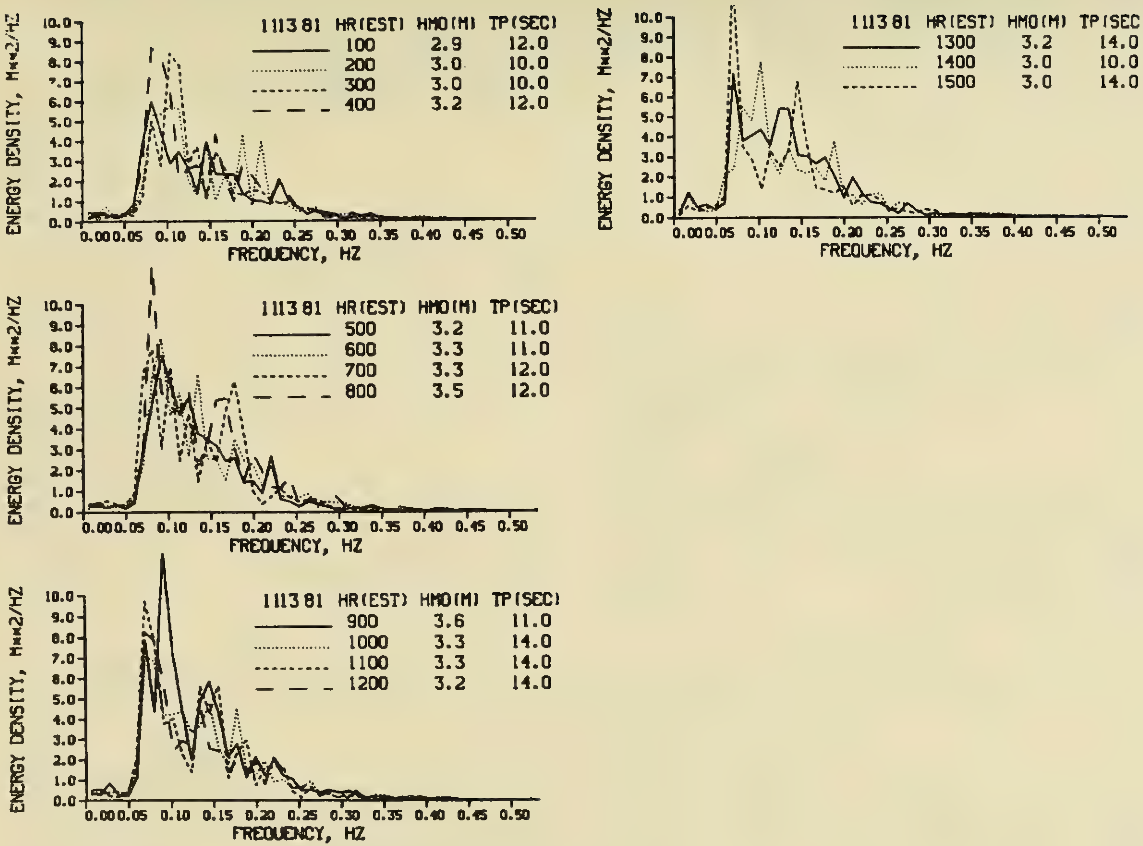


Figure B13. (Sheet 22 of 27)

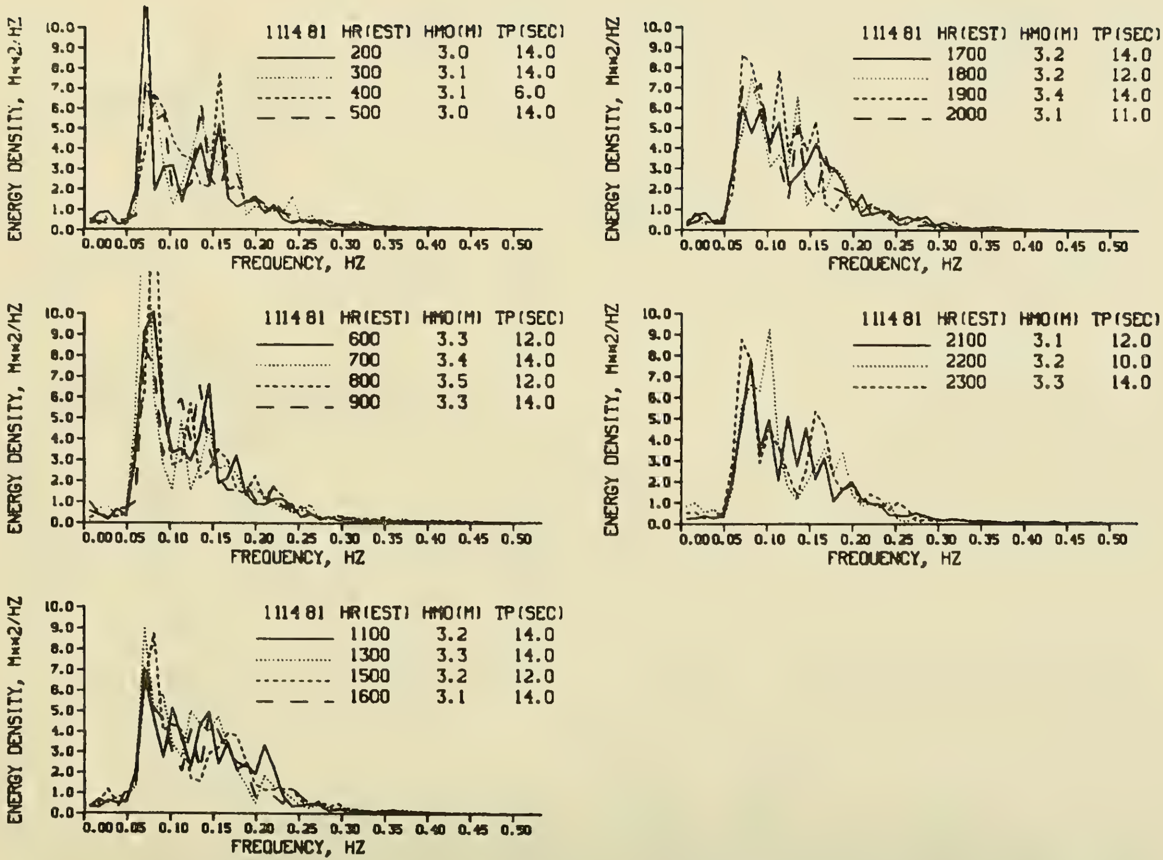


Figure B13. (Sheet 23 of 27)

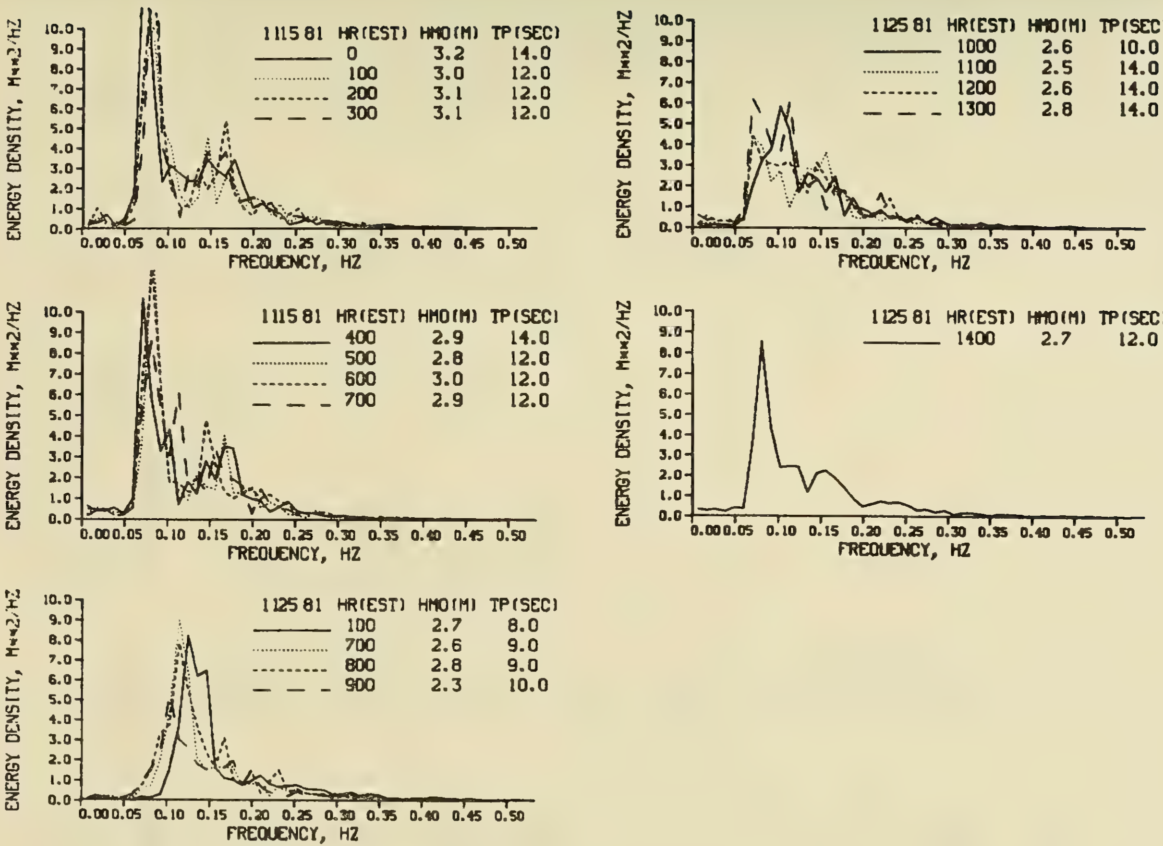


Figure B13. (Sheet 24 of 27)

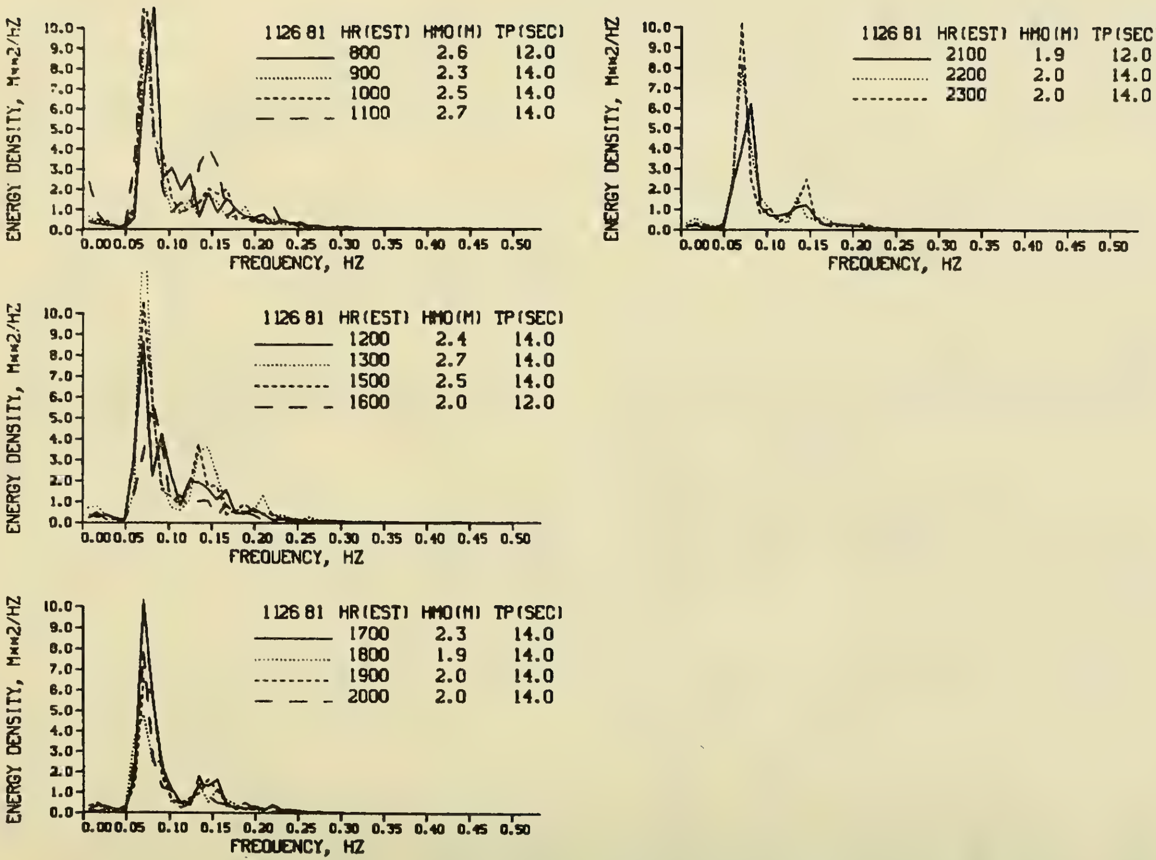


Figure B13. (Sheet 25 of 27)

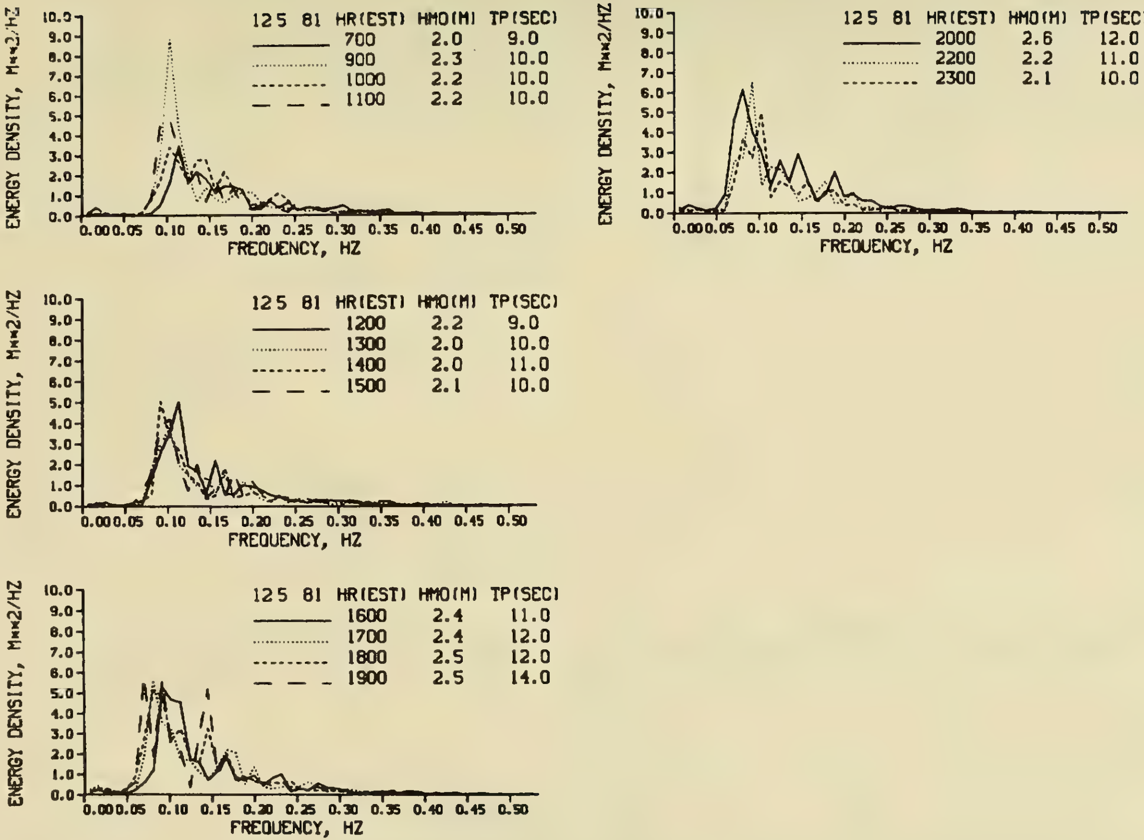


Figure B13. (Sheet 26 of 27)

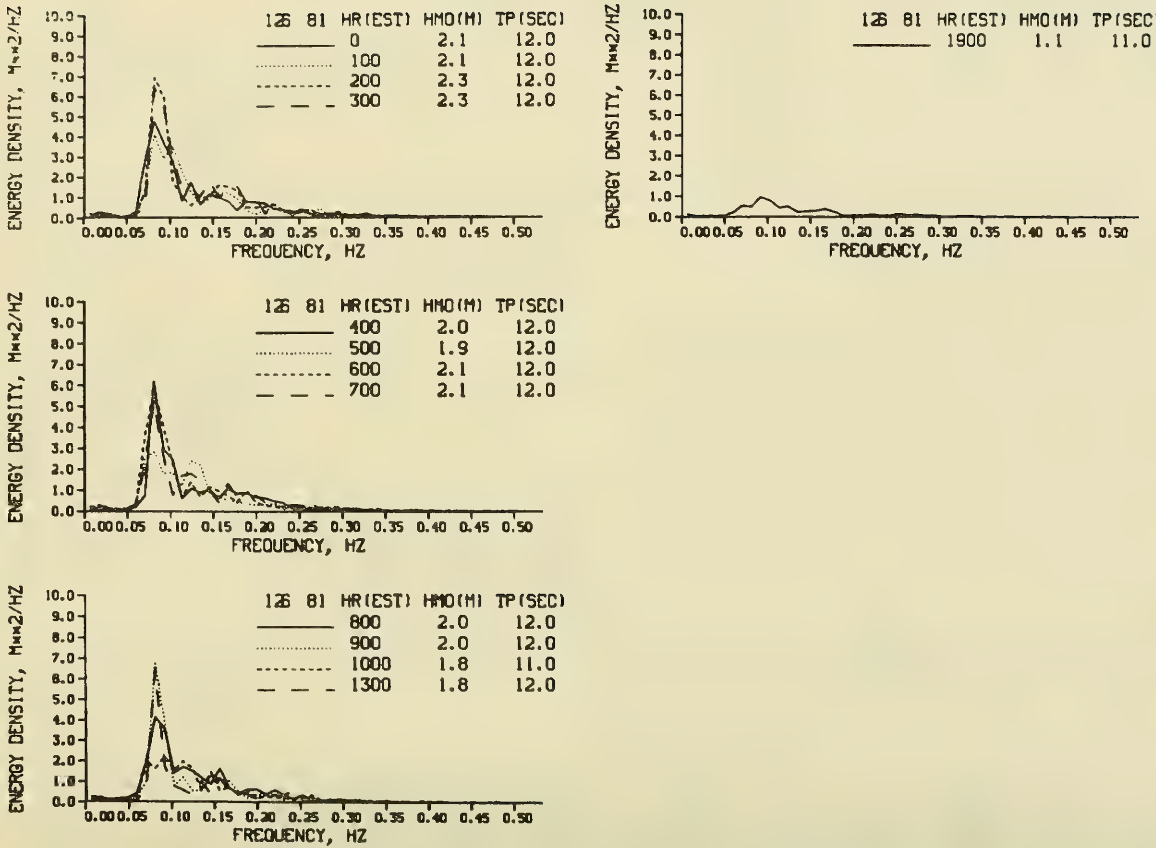


Figure B13. (Sheet 27 of 27)

Table B10

1981 Wave Gage History for Gage 620

Type of Gage and Location	Coordinates	Beginning of Proper Operation	End of Proper Operation	Explanation	Gage Length m	Gage Range m, MSL	Water Depth* m MSL	Distance from Baseline, m
Buoy-accelerometer, FRF, Duck, N. C.	36°11.1' N × 75°44.4' W	11 Nov 78	18 Sep 81	Buoy replaced for semi-annual servicing	--	Continuous	18	3

* Depth determined from 1980 bathymetric survey.

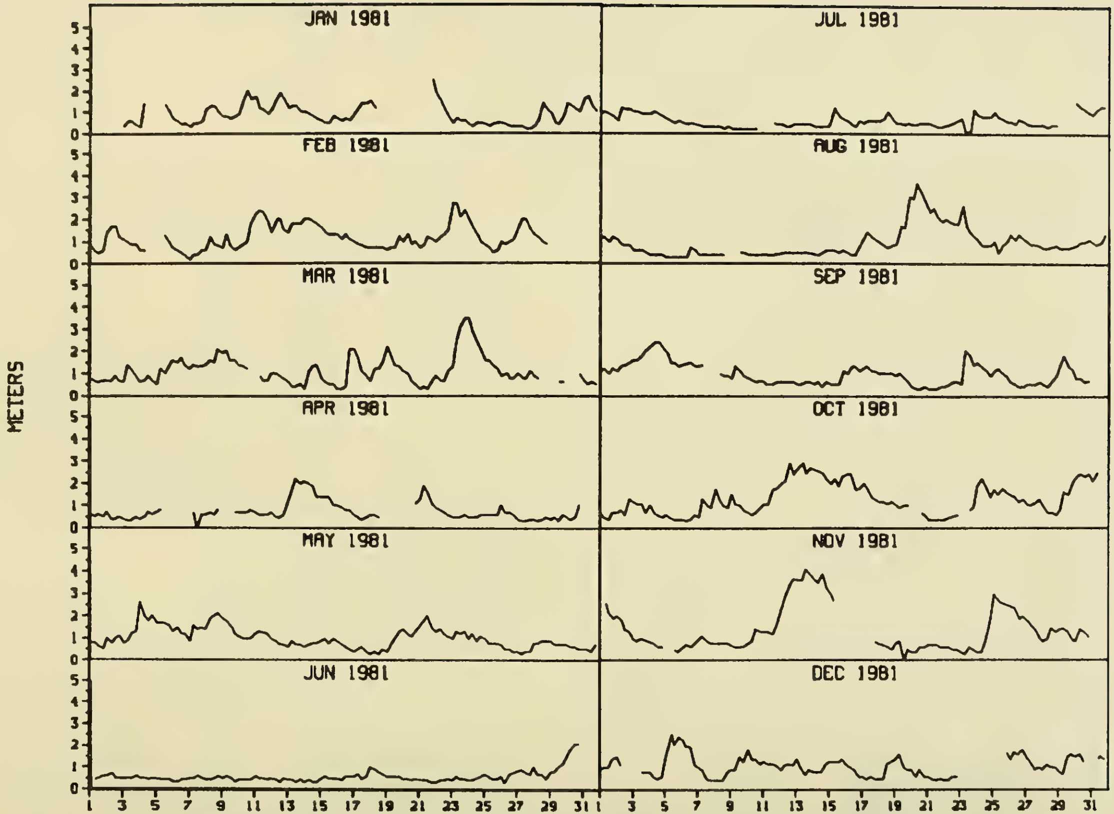


Figure B14. 1981 time history of wave height for gage 620

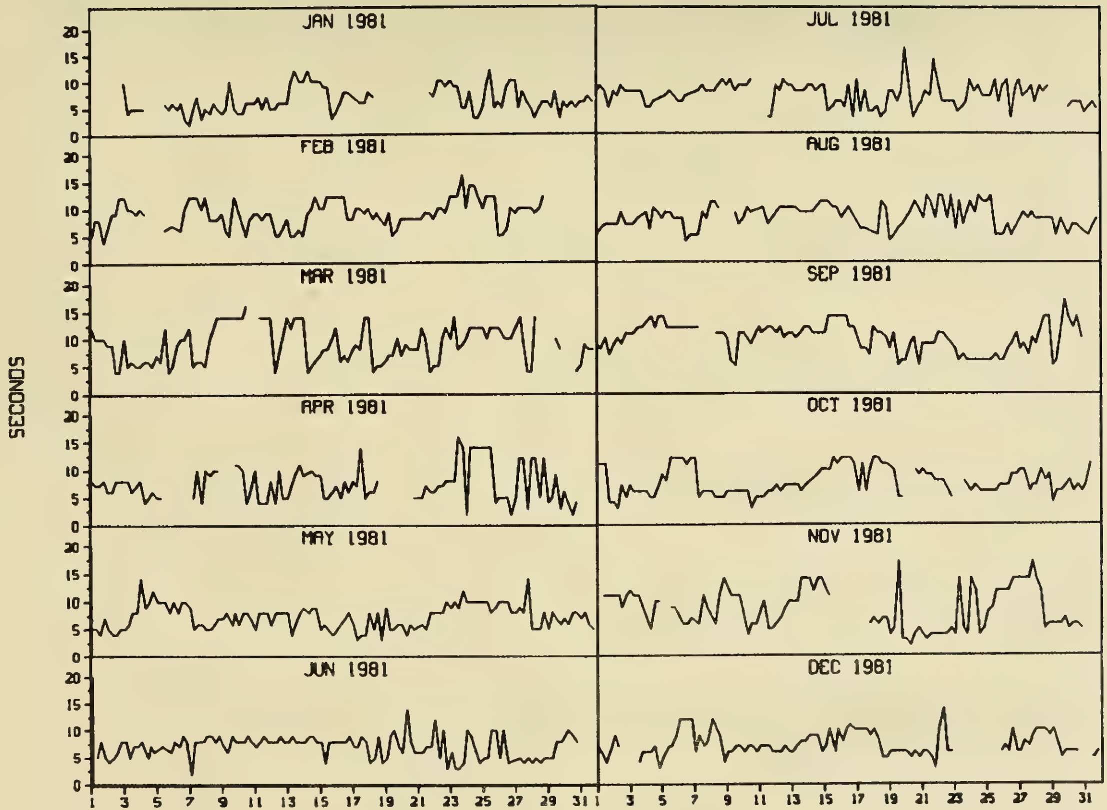


Figure B15. 1981 time history of wave period for gage 620

Table B11

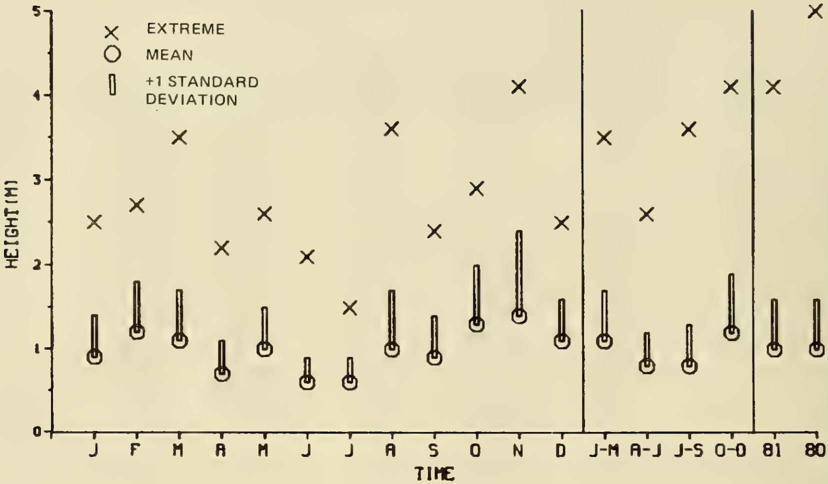
1981 Wave Statistics for Gage 620

Month	Mean Height, m	Standard Deviation Height, m	Mean Period	Standard Deviation Period	Extreme Height, m	Date	Number Observations
Jan	0.9	0.5	6.5	2.3	2.5	21	97
Feb	1.2	0.6	9.0	2.4	2.7	23	104
Mar	1.1	0.6	9.2	3.4	3.5	23	113
Apr	0.7	0.4	7.3	3.1	2.2	13	98
May	1.0	0.5	7.3	2.2	2.6	4	120
Jun	0.6	0.3	7.1	2.1	2.1	30	113
Jul	0.6	0.3	7.3	2.2	1.5	30	110
Aug	1.0	0.7	8.3	2.1	3.6	20	103
Sep	0.9	0.5	10.1	2.6	2.4	4	111
Oct	1.3	0.7	7.7	2.4	2.9	12	114
Nov	1.4	1.0	8.4	3.6	4.1	13	95
Dec	1.1	0.5	7.3	2.1	2.5	5	105
Jan-Mar	1.1	0.6	8.3	3.0	3.5	Mar	314
Apr-Jun	0.8	0.4	7.3	2.5	2.6	May	331
Jul-Sep	0.8	0.5	8.6	2.6	3.6	Aug	324
Oct-Dec	1.2	0.7	7.8	2.8	4.1	Nov	314
Annual	1.0	0.6	8.0	2.8	4.1	Nov	1,283

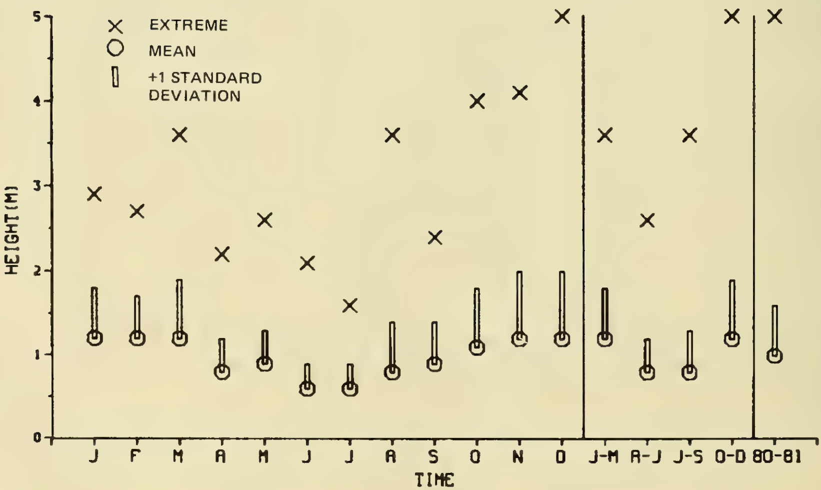
Table B12

1980 Plus 1981 Wave Statistics for Gage 620

Month	Mean Height, m	Standard Deviation Height, m	Mean Period	Standard Deviation Period	Extreme Height, m	Date	Number Observations
Jan	1.2	0.6	7.4	2.9	2.9	1980	169
Feb	1.2	0.5	9.0	2.6	2.7	1981	152
Mar	1.2	0.7	9.6	3.2	3.6	1980	177
Apr	0.8	0.4	8.0	3.1	2.2	1981	163
May	0.9	0.4	7.4	2.3	2.6	1981	179
Jun	0.6	0.3	7.2	2.0	2.1	1981	151
Jul	0.6	0.3	7.6	2.5	1.6	1980	163
Aug	0.8	0.6	8.4	2.2	3.6	1981	153
Sep	0.9	0.5	9.9	2.7	2.4	1981	159
Oct	1.1	0.7	8.3	2.7	4.0	1980	231
Nov	1.2	0.8	8.0	3.1	4.1	1981	177
Dec	1.2	0.8	7.7	2.6	5.6	1980	216
Jan-Mar	1.2	0.6	8.7	3.1	3.6	Mar 1980	498
Apr-Jun	0.8	0.4	7.5	2.5	2.6	May 1981	493
Jul-Sep	0.8	0.5	8.6	2.7	3.6	Aug 1981	475
Oct-Dec	1.2	0.7	8.0	2.8	5.6	Dec 1980	624
Annual	1.0	0.6	8.2	2.8	5.6	Dec 1980	2,090

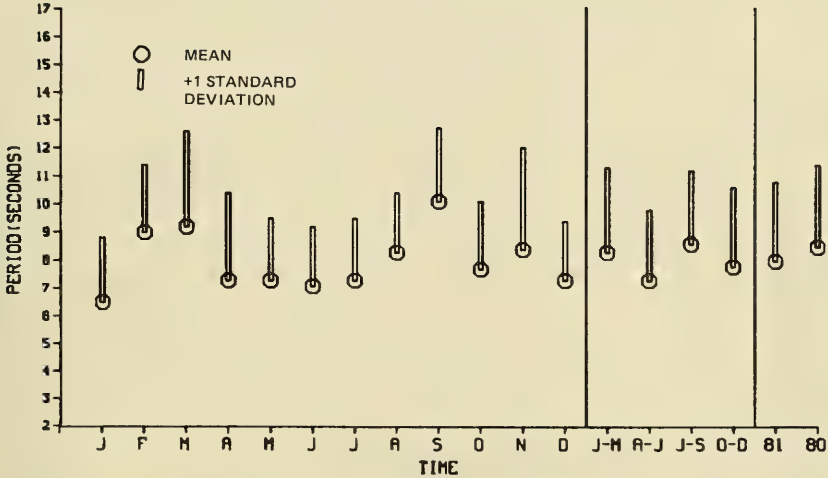


a. 1981

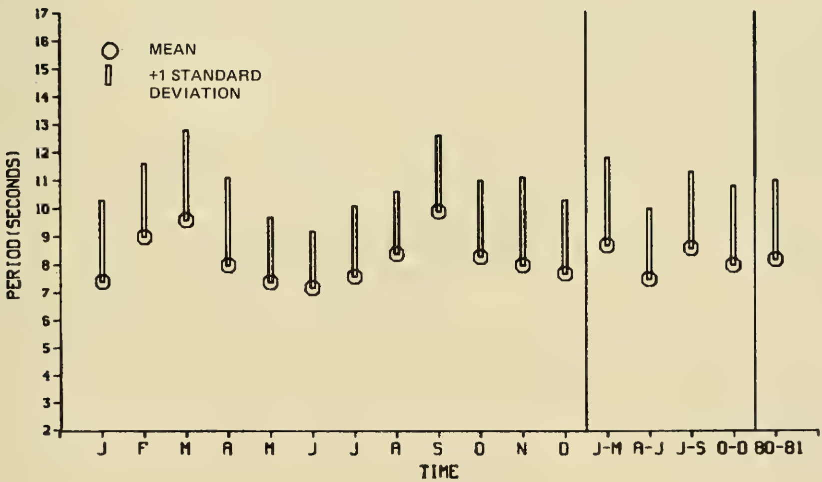


b. 1980 plus 1981

Figure B16. Monthly, seasonal, and annual extreme, mean, and standard deviation of wave height for gage 620



a. 1981



b. 1980 plus 1981

Figure B17. Monthly, seasonal, and annual mean and standard deviation of wave period for gage 620

Table B13

1981 Annual and Seasonal Joint Distribution of Wave Height

Versus Peak Period for Gage 620

ANNUAL
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS)													TOTAL
	1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	
0.00 - .49	2	2	4	14	12	7	40	37	16	5	15	7	.	161
.50 - .99	3	18	41	62	45	36	69	39	52	23	16	19	.	423
1.00 - 1.49	.	1	12	39	57	28	23	15	28	8	23	7	2	243
1.50 - 1.99	.	.	1	12	27	7	6	7	11	6	9	6	.	92
2.00 - 2.49	.	.	.	3	7	6	4	6	5	4	10	5	.	50
2.50 - 2.99	.	.	.	.	2	5	2	2	1	2	4	2	.	20
3.00 - 3.49	.	.	.	.	.	1	2	1	.	1	1	1	.	7
3.50 - 3.99	.	.	.	.	.	.	.	2	3	.	1	2	.	8
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	1	.	1
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	5	21	58	130	150	90	146	109	116	49	79	50	2	

SEASONAL JAN-MAR
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS)													TOTAL
	1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	
0.00 - .49	3	.	.	22	10	3	13	6	16	.	22	6	.	101
.50 - .99	.	22	29	57	22	19	57	45	70	.	29	29	.	379
1.00 - 1.49	.	.	22	51	61	16	29	16	48	.	48	16	.	307
1.50 - 1.99	.	.	3	16	25	6	6	22	22	.	10	13	.	123
2.00 - 2.49	.	.	.	10	10	.	6	10	10	.	10	10	.	66
2.50 - 2.99	.	.	.	.	.	.	3	.	.	.	10	3	.	16
3.00 - 3.49	.	.	.	.	.	.	3	.	.	.	.	.	.	3
3.50 - 3.99	.	.	.	.	.	.	.	3	3	.	.	.	.	6
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	3	22	54	156	128	44	117	102	169	0	129	77	0	

SEASONAL APR-JUN
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS)													TOTAL
	1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	
0.00 - .49	.	3	9	15	21	15	73	36	9	.	15	6	.	202
.50 - .99	12	18	60	109	51	54	121	39	42	6	3	21	.	536
1.00 - 1.49	.	.	18	36	27	6	36	12	27	.	3	.	.	165
1.50 - 1.99	.	.	.	9	9	9	12	3	18	.	.	.	.	60
2.00 - 2.49	.	.	.	3	3	3	3	12	.	3	3	.	.	30
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	3	.	3
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	12	21	87	172	111	87	245	102	96	9	24	30	0	

(Continued)

Table B13 (Concluded)

SEASONAL JUL-SEP
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	3	3	15	19	9	62	93	31	15	3	6	.	259
.50 - .99	.	12	22	37	34	34	71	43	59	59	28	19	.	418
1.00 - 1.49	.	3	3	28	43	40	22	15	9	19	25	9	3	219
1.50 - 1.99	.	.	.	6	9	3	6	.	.	12	19	3	.	58
2.00 - 2.49	.	.	.	.	3	.	3	.	.	3	9	6	.	24
2.50 - 2.99	.	.	.	.	3	.	3	.	3	.	3	.	.	12
3.00 - 3.49	.	.	.	.	.	3	.	.	.	3	.	.	.	6
3.50 - 3.99	.	.	.	.	.	.	.	3	.	.	.	.	.	3
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	18	28	86	111	89	167	154	102	111	87	43	3	

SEASONAL OCT-DEC
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	3	3	3	3	.	.	10	13	6	6	19	10	.	76
.50 - .99	.	19	51	41	73	35	25	29	38	29	6	6	.	352
1.00 - 1.49	.	.	3	41	99	51	6	16	29	13	16	3	3	280
1.50 - 1.99	.	.	.	19	67	10	.	3	3	13	6	10	.	131
2.00 - 2.49	.	.	.	.	13	22	3	3	10	10	19	3	.	83
2.50 - 2.99	.	.	.	.	3	19	.	6	.	10	3	.	.	41
3.00 - 3.49	.	.	.	.	.	.	3	3	.	.	3	3	.	12
3.50 - 3.99	.	.	.	.	.	.	.	.	10	.	3	6	.	19
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	3	.	3
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	3	22	57	104	255	137	47	73	96	81	75	44	3	

Table B14

1981 Monthly Joint Distribution of Wave Height

Versus Peak Period for Gage 620

MONTH JAN
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	10	.	.	72	21	.	31	21	31	.	10	.	.	196
.50 - .99	.	72	41	82	41	21	21	52	52	.	10	.	.	392
1.00 - 1.49	.	.	10	93	93	31	.	.	41	.	10	.	.	278
1.50 - 1.99	.	.	10	10	62	10	10	.	10	.	.	.	.	112
2.00 - 2.49	.	.	.	.	10	.	.	.	.	.	.	.	.	10
2.50 - 2.99	.	.	.	.	.	.	10	.	.	.	.	.	.	10
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	10	72	61	257	227	62	72	73	134	0	30	0	0	

MONTH FEB
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	.	.	.	.	.	.	.	10	.	29	.	.	39
.50 - .99	.	.	10	38	10	19	87	58	67	.	58	.	.	347
1.00 - 1.49	.	.	.	19	48	.	77	38	67	.	77	10	.	336
1.50 - 1.99	.	.	.	19	19	.	10	48	29	.	10	10	.	145
2.00 - 2.49	.	.	.	29	.	.	10	29	29	.	10	10	.	117
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	19	.	.	19
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	0	10	105	77	19	184	173	202	0	203	30	0	

MONTH MAR
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	.	.	.	9	9	9	.	9	.	27	18	.	81
.50 - .99	.	.	35	53	18	18	62	27	88	.	18	80	.	399
1.00 - 1.49	.	.	53	44	44	18	9	9	35	.	53	35	.	300
1.50 - 1.99	.	.	.	18	.	9	.	18	27	.	18	27	.	117
2.00 - 2.49	.	.	.	.	18	.	9	.	.	.	18	18	.	63
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	9	9	.	18
3.00 - 3.49	.	.	.	.	.	.	9	.	.	.	.	.	.	9
3.50 - 3.99	.	.	.	.	.	.	.	9	9	.	.	.	.	18
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	0	88	115	89	54	98	63	168	0	143	187	0	

(Continued)

(Sheet 1 of 4)

Table B14 (Continued)

MONTH APR
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	10	20	20	20	.	41	10	.	.	41	10	.	172
.50 - .99	31	10	82	102	82	61	102	10	61	20	10	61	.	632
1.00 - 1.49	.	.	10	61	20	10	.	20	.	.	.	.	.	121
1.50 - 1.99	.	.	.	10	.	20	.	.	10	.	.	.	.	40
2.00 - 2.49	.	.	.	.	.	.	.	20	.	10	.	.	.	30
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	31	20	112	193	122	91	143	60	71	30	51	71	0	

MONTH MAY
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	.	8	8	17	.	42	17	.	.	.	8	.	100
.50 - .99	.	17	33	92	33	42	108	42	42	.	.	.	.	409
1.00 - 1.49	.	.	25	50	58	8	83	17	75	.	8	.	.	324
1.50 - 1.99	.	.	.	17	25	8	33	.	33	.	.	.	.	116
2.00 - 2.49	.	.	.	8	8	8	.	8	.	.	8	.	.	40
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	8	.	8
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	17	66	175	141	66	266	84	150	0	16	16	0	

MONTH JUN
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	.	.	18	27	44	133	80	27	.	9	.	.	338
.50 - .99	9	27	71	133	44	62	150	62	27	.	.	9	.	594
1.00 - 1.49	.	.	18	.	.	.	18	.	.	.	.	.	.	36
1.50 - 1.99	.	.	.	.	.	.	.	9	9	.	.	.	.	18
2.00 - 2.49	.	.	.	.	.	.	9	9	.	.	.	.	.	18
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	9	27	89	151	71	106	310	160	63	0	9	9	0	

(Continued)

(Sheet 2 of 4)

MONTH JUL
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	9	9	18	36	18	127	145	36	.	.	18	.	416
.50 - .99	.	36	45	45	64	45	100	36	45	.	.	.	.	416
1.00 - 1.49	.	9	9	27	45	18	27	18	.	.	.	.	.	153
1.50 - 1.99	.	.	.	9	.	.	.	.	.	.	.	.	.	9
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	54	63	99	145	81	254	199	81	0	0	18	0	

MONTH AUG
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	.	.	19	10	10	58	78	49	19	.	.	.	243
.50 - .99	.	.	19	58	.	49	78	58	78	49	19	.	.	408
1.00 - 1.49	.	.	.	39	39	78	10	.	.	19	.	.	.	185
1.50 - 1.99	.	.	.	10	10	.	19	.	.	10	19	.	.	68
2.00 - 2.49	.	.	.	.	.	.	10	.	.	10	10	.	.	30
2.50 - 2.99	.	.	.	.	10	.	10	.	10	.	10	.	.	40
3.00 - 3.49	.	.	.	.	.	10	.	.	.	10	.	.	.	20
3.50 - 3.99	.	.	.	.	.	.	.	10	.	.	.	.	.	10
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	0	19	126	69	147	185	146	137	117	58	0	0	

MONTH SEP
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	.	.	9	9	.	.	54	9	27	9	.	.	117
.50 - .99	.	.	.	9	36	9	36	36	54	126	63	54	.	423
1.00 - 1.49	.	.	.	18	45	27	27	27	27	36	72	27	9	315
1.50 - 1.99	.	.	.	.	18	9	.	.	.	27	36	9	.	99
2.00 - 2.49	.	.	.	.	9	.	.	.	.	.	18	18	.	45
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	0	0	36	117	45	63	117	90	216	198	108	9	

(Continued)

Table B14 (Concluded)

MONTH OCT
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	.	.	.	.	.	18	18	9	18	35	.	.	98
.50 - .99	.	18	26	44	44	26	35	26	26	18	18	.	.	281
1.00 - 1.49	.	.	.	70	79	35	.	18	26	18	18	.	.	264
1.50 - 1.99	.	.	.	.	96	18	.	.	.	18	18	.	.	150
2.00 - 2.49	.	.	.	.	35	53	9	.	26	9	18	.	.	150
2.50 - 2.99	.	.	.	.	9	35	.	9	.	9	.	.	.	62
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	18	26	114	263	167	62	71	87	90	107	0	0	

MONTH NOV
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	11	11	11	.	.	.	.	11	.	.	11	21	.	76
.50 - .99	.	21	116	63	53	42	.	21	21	63	.	21	.	421
1.00 - 1.49	.	.	.	21	84	11	.	11	11	21	21	11	11	202
1.50 - 1.99	.	.	.	32	11	.	.	.	.	21	.	32	.	96
2.00 - 2.49	.	.	.	.	.	.	.	.	.	21	11	11	.	43
2.50 - 2.99	.	.	.	.	.	11	.	11	.	21	11	.	.	54
3.00 - 3.49	.	.	.	.	.	.	11	11	.	.	11	11	.	44
3.50 - 3.99	.	.	.	.	.	.	.	.	32	.	11	21	.	64
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	11	.	11
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	11	32	127	116	148	64	11	65	64	147	76	139	11	

MONTH DEC
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	.	.	10	.	.	10	10	10	.	10	10	.	60
.50 - .99	.	19	19	19	124	38	38	38	67	10	.	.	.	372
1.00 - 1.49	.	.	10	29	133	105	19	19	48	.	10	.	.	373
1.50 - 1.99	.	.	.	29	86	10	.	10	10	.	.	.	.	145
2.00 - 2.49	.	.	.	.	.	10	.	10	.	.	29	.	.	49
2.50 - 2.99	.	.	.	.	.	10	.	.	.	.	.	.	.	10
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	19	29	87	343	173	67	87	135	10	49	10	0	

(Sheet 4 of 4)

Table B15

1980 Plus 1981 Annual and Seasonal Joint Distribution of Wave Height Versus Peak Period for Gage 620

ANNUAL
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	1	1	4	10	10	9	32	33	15	6	20	10	.	151
.50 - .99	4	15	34	52	52	35	66	49	51	31	22	20	.	431
1.00 - 1.49	.	.	15	34	55	29	18	15	25	14	24	8	1	238
1.50 - 1.99	.	.	1	9	28	11	9	6	13	7	9	7	.	100
2.00 - 2.49	.	.	.	2	8	6	5	5	4	5	8	5	.	48
2.50 - 2.99	.	.	.	.	1	3	1	2	1	3	4	2	.	17
3.00 - 3.49	.	.	.	.	.	.	2	1	.	1	1	.	.	5
3.50 - 3.99	.	.	.	.	.	.	.	1	2	1	1	1	.	6
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	5	16	54	107	154	93	133	112	111	68	89	53	1	

SEASONAL JAN-MAR
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	2	.	.	14	6	2	16	8	10	2	24	6	.	90
.50 - .99	.	16	24	44	36	22	38	38	50	8	22	20	.	318
1.00 - 1.49	.	.	22	52	52	16	20	14	48	20	60	18	.	322
1.50 - 1.99	.	.	2	14	26	12	6	16	32	4	16	20	.	148
2.00 - 2.49	.	.	.	8	12	2	6	6	10	6	14	16	2	82
2.50 - 2.99	.	.	.	.	.	.	2	.	2	2	12	6	.	24
3.00 - 3.49	.	.	.	.	.	.	2	2	.	.	.	.	.	4
3.50 - 3.99	.	.	.	.	.	.	.	4	2	.	2	.	.	8
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	2	16	48	132	132	54	90	88	154	42	150	86	2	

SEASONAL APR-JUN
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	2	6	14	16	16	53	45	10	.	12	4	2	180
.50 - .99	8	16	61	83	59	55	112	53	47	22	24	22	.	562
1.00 - 1.49	.	.	24	28	28	20	24	18	26	2	2	2	.	174
1.50 - 1.99	.	.	2	6	10	6	12	2	14	2	4	.	.	58
2.00 - 2.49	.	.	.	2	2	2	2	8	.	4	2	.	.	22
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	2	.	2
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	8	18	93	133	115	99	203	126	97	30	44	30	2	

(Continued)

SEASONAL JUL-SEP
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	2	2	11	17	19	55	63	27	13	11	13	2	235
.50 - .99	.	11	23	40	42	38	86	69	65	57	34	29	.	494
1.00 - 1.49	.	2	2	23	44	34	17	11	6	13	19	11	2	184
1.50 - 1.99	.	.	.	4	8	6	8	2	.	8	13	2	.	51
2.00 - 2.49	.	.	.	.	2	.	2	2	.	2	6	4	.	18
2.50 - 2.99	.	.	.	.	2	.	2	.	2	.	2	.	.	8
3.00 - 3.49	.	.	.	.	.	2	.	.	.	2	.	.	.	4
3.50 - 3.99	.	.	.	.	.	.	.	2	.	.	.	.	.	2
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	15	27	78	115	99	170	149	100	95	65	59	4	

SEASONAL OCT-DEC
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	2	2	6	3	2	2	11	22	13	8	29	16	2	118
.50 - .99	6	16	29	43	66	27	35	38	45	37	11	10	.	363
1.00 - 1.49	.	.	13	34	85	43	11	18	19	19	18	2	2	264
1.50 - 1.99	.	.	.	11	58	19	10	5	6	11	5	5	.	130
2.00 - 2.49	.	.	.	.	13	18	8	3	6	6	10	2	.	66
2.50 - 2.99	.	.	.	.	2	10	.	6	.	8	2	.	.	28
3.00 - 3.49	.	.	.	.	.	.	6	3	.	2	3	2	.	16
3.50 - 3.99	.	.	.	.	.	.	.	.	5	3	2	3	.	13
4.00 - 4.49	.	.	.	.	.	.	.	.	.	2	.	2	.	4
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	2	2	.	4
TOTAL	8	18	48	91	226	119	81	95	94	96	82	44	4	

Table B16

1980 Plus 1981 Monthly Joint Distribution of Wave Height

Versus Peak Period for Gage 620

MONTH JAN
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 10.9	11.0- 11.9	12.0- 13.9	14.0- 16.9	17.0- LONGER	TOTAL
0.00 - .49	6	.	.	41	12	.	36	12	18	.	6	6	.	137
.50 - .99	.	41	30	53	41	36	12	30	30	12	6	.	.	291
1.00 - 1.49	.	.	30	83	83	30	.	.	41	6	12	.	.	285
1.50 - 1.99	.	.	6	18	47	12	12	6	41	6	.	6	.	154
2.00 - 2.49	.	.	.	6	12	6	6	.	12	18	6	24	6	96
2.50 - 2.99	.	.	.	.	.	.	6	.	6	6	12	12	.	42
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	6	41	66	201	195	84	72	48	148	48	42	48	6	

MONTH FEB
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 10.9	11.0- 11.9	12.0- 13.9	14.0- 16.9	17.0- LONGER	TOTAL
0.00 - .49	.	.	.	.	.	.	.	.	7	.	46	.	.	53
.50 - .99	.	7	7	46	33	13	59	66	53	13	53	.	.	350
1.00 - 1.49	.	.	.	33	46	.	53	33	46	33	66	13	.	323
1.50 - 1.99	.	.	.	13	33	20	7	33	33	.	13	13	.	165
2.00 - 2.49	.	.	.	20	13	.	7	20	20	.	7	13	.	100
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	13	.	.	13
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	7	7	112	125	33	126	152	159	46	198	39	0	

MONTH MAR
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 10.9	11.0- 11.9	12.0- 13.9	14.0- 16.9	17.0- LONGER	TOTAL
0.00 - .49	.	.	.	.	6	6	11	11	6	6	23	11	.	80
.50 - .99	.	.	34	34	34	17	45	23	68	.	11	56	.	322
1.00 - 1.49	.	.	34	40	28	17	11	11	56	23	102	40	.	362
1.50 - 1.99	.	.	.	11	.	6	.	11	23	6	34	40	.	131
2.00 - 2.49	.	.	.	.	11	.	6	.	.	.	23	11	.	56
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	11	6	.	17
3.00 - 3.49	.	.	.	.	.	.	6	6	.	.	.	.	.	12
3.50 - 3.99	.	.	.	.	.	.	.	11	6	.	6	.	.	23
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	0	68	85	79	46	79	73	159	35	215	164	0	

(Continued) (Sheet 1 of 4)

Table B16 (Continued)

MONTH APR
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	6	12	12	12	.	25	6	.	.	25	6	.	104
.50 - .99	18	6	61	67	86	49	80	49	74	61	37	61	.	649
1.00 - 1.49	.	.	25	37	18	25	.	25	18	6	.	6	.	160
1.50 - 1.99	.	.	.	6	6	12	6	.	12	6	12	.	.	60
2.00 - 2.49	.	.	.	.	.	.	.	12	.	12	.	.	.	24
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	18	12	98	122	122	86	111	92	104	85	74	73	0	

MONTH MAY
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	.	6	17	11	17	28	56	11	.	6	6	.	158
.50 - .99	.	22	56	78	39	50	95	39	28	6	34	.	.	447
1.00 - 1.49	.	.	28	39	45	22	56	22	56	.	6	.	.	274
1.50 - 1.99	.	.	.	11	22	6	28	.	22	.	.	.	.	89
2.00 - 2.49	.	.	.	6	6	6	.	6	.	.	6	.	.	30
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	6	.	6
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	22	90	151	123	101	207	123	117	6	52	12	0	

MONTH JUN
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	.	.	13	26	33	113	73	20	.	7	.	7	292
.50 - .99	7	20	66	106	53	66	166	73	40	.	.	7	.	604
1.00 - 1.49	.	.	20	7	20	13	13	7	.	.	.	.	.	80
1.50 - 1.99	.	.	7	.	.	.	.	7	7	.	.	.	.	21
2.00 - 2.49	.	.	.	.	.	.	7	7	.	.	.	.	.	14
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	7	20	93	126	99	112	299	167	67	0	7	7	7	

(Continued)

(Sheet 2 of 4)

Table B16 (Continued)

MONTH JUL

PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	6	6	12	25	25	92	98	31	.	18	25	.	338
.50 - .99	.	25	37	61	86	55	123	55	37	.	.	31	.	510
1.00 - 1.49	.	6	6	18	43	18	25	12	.	.	.	.	.	128
1.50 - 1.99	.	.	.	6	.	.	12	.	.	.	.	.	.	18
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	37	49	97	154	98	252	165	68	0	18	56	0	

MONTH AUG

PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	.	.	13	20	26	72	52	39	20	.	7	.	249
.50 - .99	.	.	26	46	.	46	105	85	85	52	26	13	.	484
1.00 - 1.49	.	.	.	33	39	52	7	.	.	13	.	.	.	144
1.50 - 1.99	.	.	.	7	13	7	13	.	.	7	13	.	.	60
2.00 - 2.49	.	.	.	.	.	.	7	.	.	7	7	.	.	21
2.50 - 2.99	.	.	.	.	7	.	7	.	7	.	7	.	.	28
3.00 - 3.49	.	.	.	.	.	7	.	.	.	7	.	.	.	14
3.50 - 3.99	.	.	.	.	.	.	.	7	.	.	.	.	.	7
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	0	26	99	79	138	211	144	131	106	53	20	0	

MONTH SEP

PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	.	.	6	6	6	.	38	13	19	13	6	6	113
.50 - .99	.	6	6	13	38	13	31	69	75	119	75	44	.	489
1.00 - 1.49	.	.	.	19	50	31	19	19	19	25	57	31	6	276
1.50 - 1.99	.	.	.	.	13	13	.	6	.	19	25	6	.	82
2.00 - 2.49	.	.	.	.	6	.	.	6	.	.	13	13	.	38
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	6	6	38	113	63	50	138	107	182	183	100	12	

(Continued)

(Sheet 3 of 4)

Table B16 (Concluded)

MONTH OCT
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	.	.	.	.	.	26	35	17	9	39	13	.	139
.50 - .99	.	9	13	35	48	17	52	43	52	35	22	17	.	343
1.00 - 1.49	.	.	9	56	78	22	4	22	17	30	17	.	.	255
1.50 - 1.99	.	.	.	.	69	9	4	4	9	13	9	.	.	117
2.00 - 2.49	.	.	.	.	26	30	9	4	17	9	9	.	.	104
2.50 - 2.99	.	.	.	.	4	17	.	13	.	4	.	.	.	38
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	4	.	.	.	4
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	9	22	91	225	95	95	121	112	104	96	30	0	

MONTH NOV
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	6	6	6	.	6	6	.	28	17	6	11	11	.	103
.50 - .99	11	11	73	56	62	34	28	34	34	62	6	11	.	422
1.00 - 1.49	.	.	17	17	96	23	11	11	6	17	11	6	6	221
1.50 - 1.99	.	.	.	17	28	34	6	.	.	17	.	17	.	119
2.00 - 2.49	.	.	.	.	6	6	11	.	.	11	6	6	.	46
2.50 - 2.99	.	.	.	.	.	6	.	6	.	11	6	.	.	29
3.00 - 3.49	.	.	.	.	.	.	6	6	.	.	6	6	.	24
3.50 - 3.99	.	.	.	.	.	.	.	.	17	.	6	11	.	34
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	6	.	6
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	17	17	96	90	198	109	62	85	74	124	52	74	6	

MONTH DEC
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	.	14	9	.	.	5	5	5	9	32	23	.	102
.50 - .99	9	28	9	42	88	32	23	37	46	19	5	.	.	338
1.00 - 1.49	.	.	14	23	83	83	19	19	32	9	23	.	.	305
1.50 - 1.99	.	.	.	19	69	19	19	9	9	5	5	.	.	154
2.00 - 2.49	.	.	.	.	5	14	5	5	.	.	14	.	.	43
2.50 - 2.99	.	.	.	.	.	5	.	.	.	9	.	.	.	14
3.00 - 3.49	.	.	.	.	.	.	14	5	.	5	5	.	.	29
3.50 - 3.99	.	.	.	.	.	.	.	.	.	9	.	.	.	9
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	5	5	.	10
TOTAL	9	28	37	93	245	153	85	80	92	65	89	28	0	

(Sheet 4 of 4)

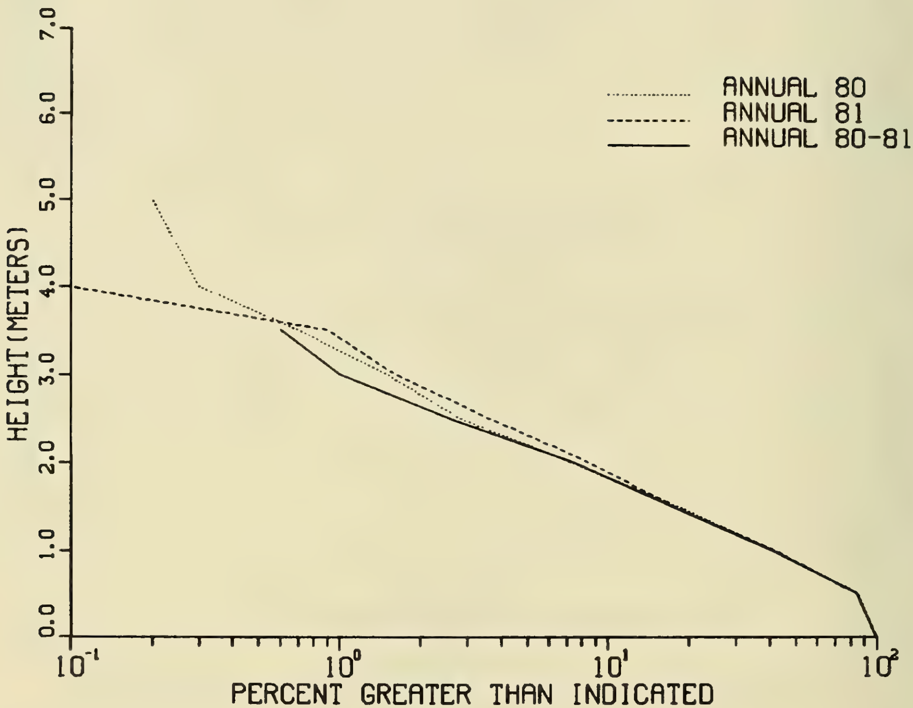
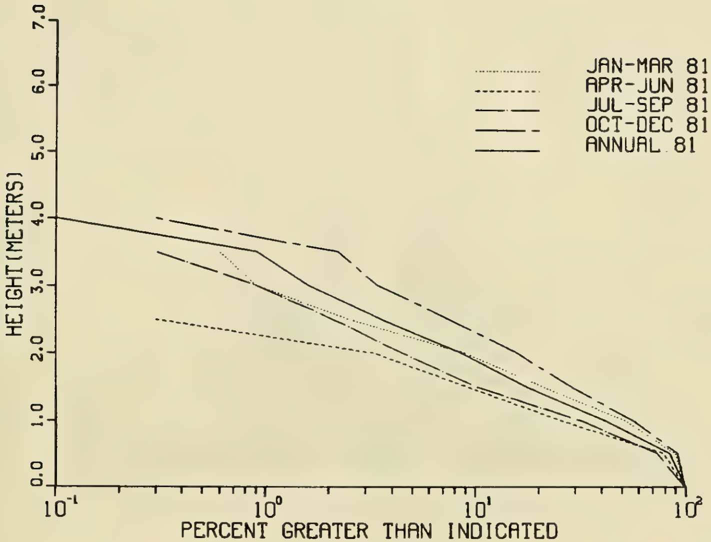
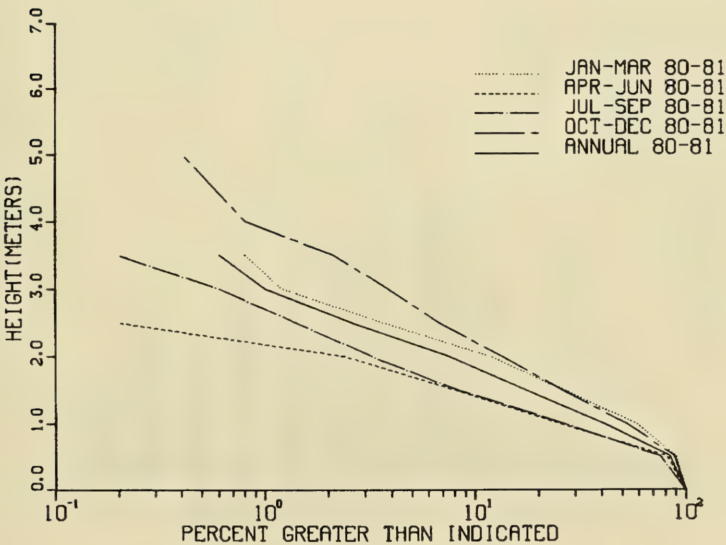


Figure B18. 1981 and 1980 plus 1981 annual cumulative distribution of wave height for gage 620

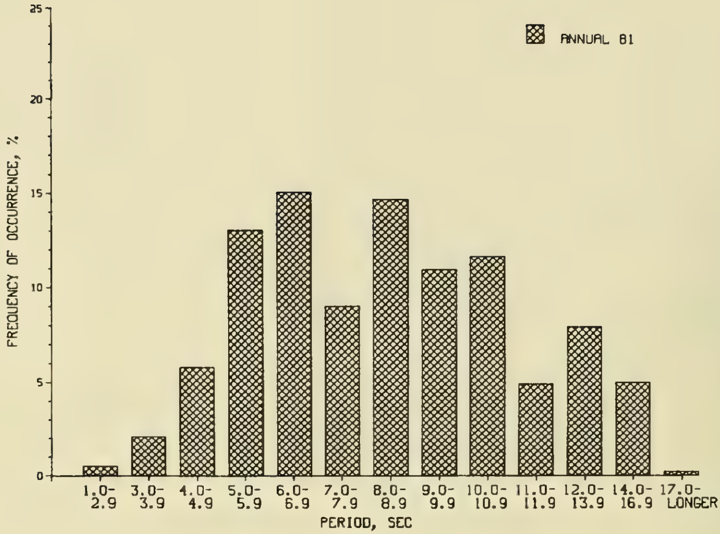


a. 1981

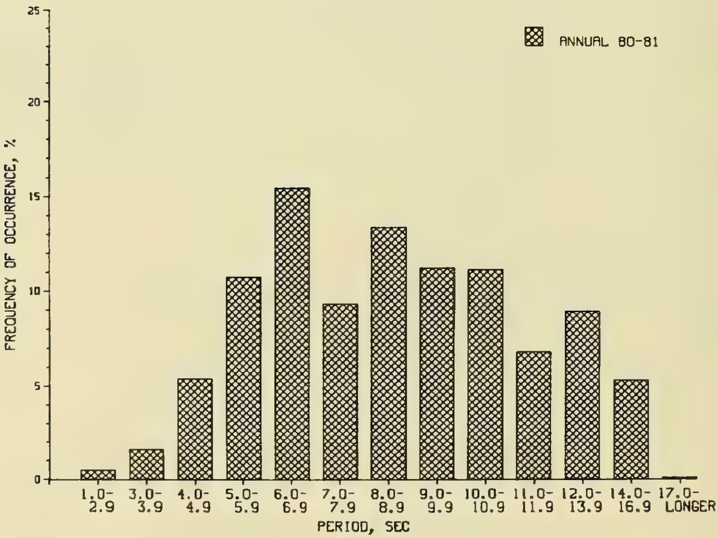


b. 1980 plus 1981

Figure B19. Seasonal and annual cumulative distribution of wave height for gage 620

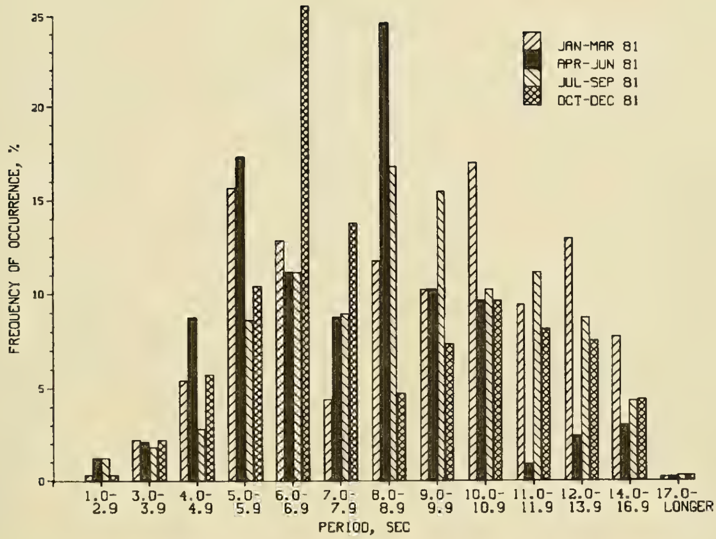


a. 1981

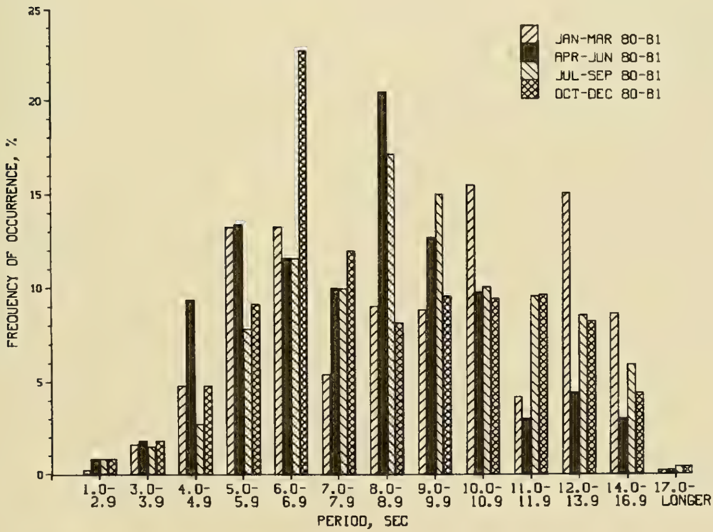


b. 1980 plus 1981

Figure B20. Annual peak spectral wave period distribution for gage 620



a. 1981



b. 1980 plus 1981

Figure B21. Seasonal peak spectral wave period distribution for gage 620

Table B17

Persistence of 1981 Wave Heights for Gage 620

	Consecutive Day(s) or Longer																											
Height, m	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	29	32	36
0.5	23	20	19		18	16	14	11				10			9	8									7	6	4	3
1.0	50	32	25	20	18	15	11	8	6	4	3																	
1.5	34	22	15	9	8	4	1																					
2.0	24	13		4	3	1																						
2.5	11	5	3	1																								
3.0	4	3		1																								
3.5	3	2	1																									
4.0	1																											

Table B18

Persistence of 1980 Plus 1981 Wave Heights for Gage 620

	Consecutive Day(s)																								
Height, m	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1.0	49	32	24	16	12	10		8	6	4	3		2				1								
1.5	35	19	12	9	6	4	2	1																	
2.0	21	10		3		1																			
2.5	10	5	3	1																					
3.0	5	3		1																					
3.5	4	2	1																						
4.0	2																								

Table B19

1981 Wave Gage History for Gage 615

Type of Gage and Location	Coordinates	Beginning of Proper Operation	End of Proper Operation	Explanation	Gage Length m	Gage Range m, MSL	Water Depth* m, MSL	Distance from Baseline m
Baylor, continuous-wire, sta 6+20 on FRF pier (189 m ENE at coordinates given)	36°10'54" N × 75°45'50" W	Nov 1978	--	Operation continuous during 1981	8.5	-1.5 to 7.0	2.7	189

* Median depth from pier profiles taken on south side from Jan-Dec 1981.

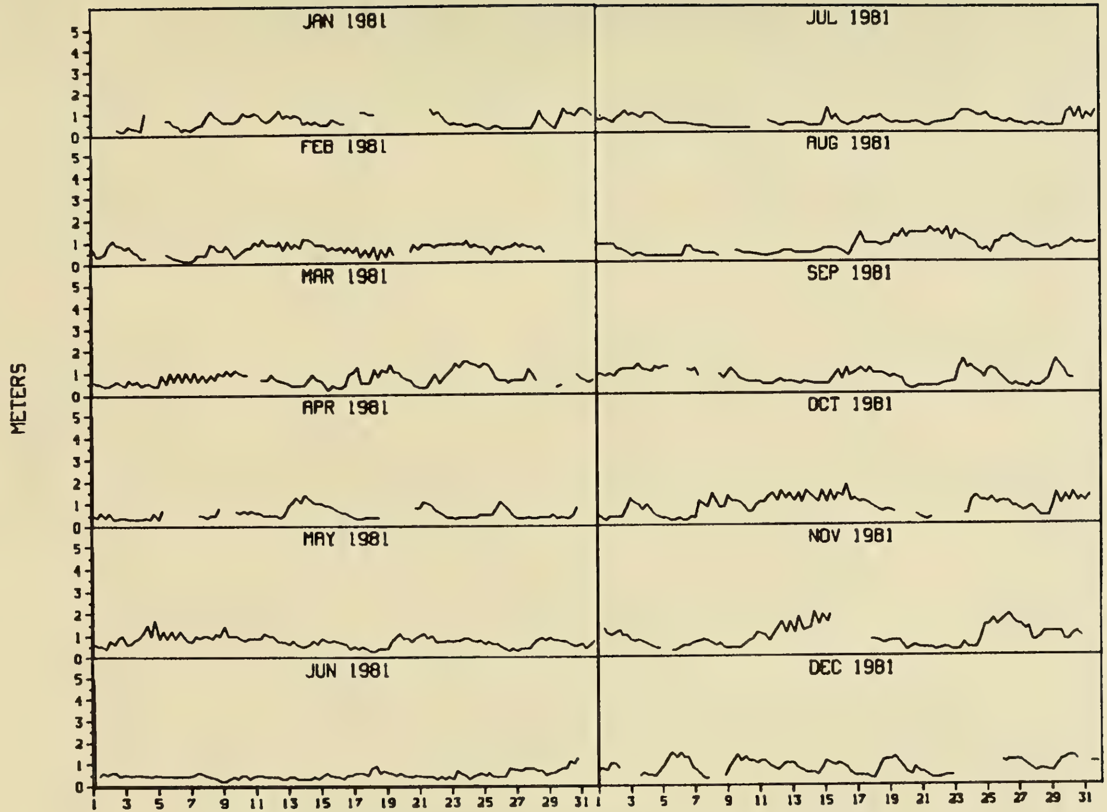


Figure B22. 1981 time history of wave height for gage 615

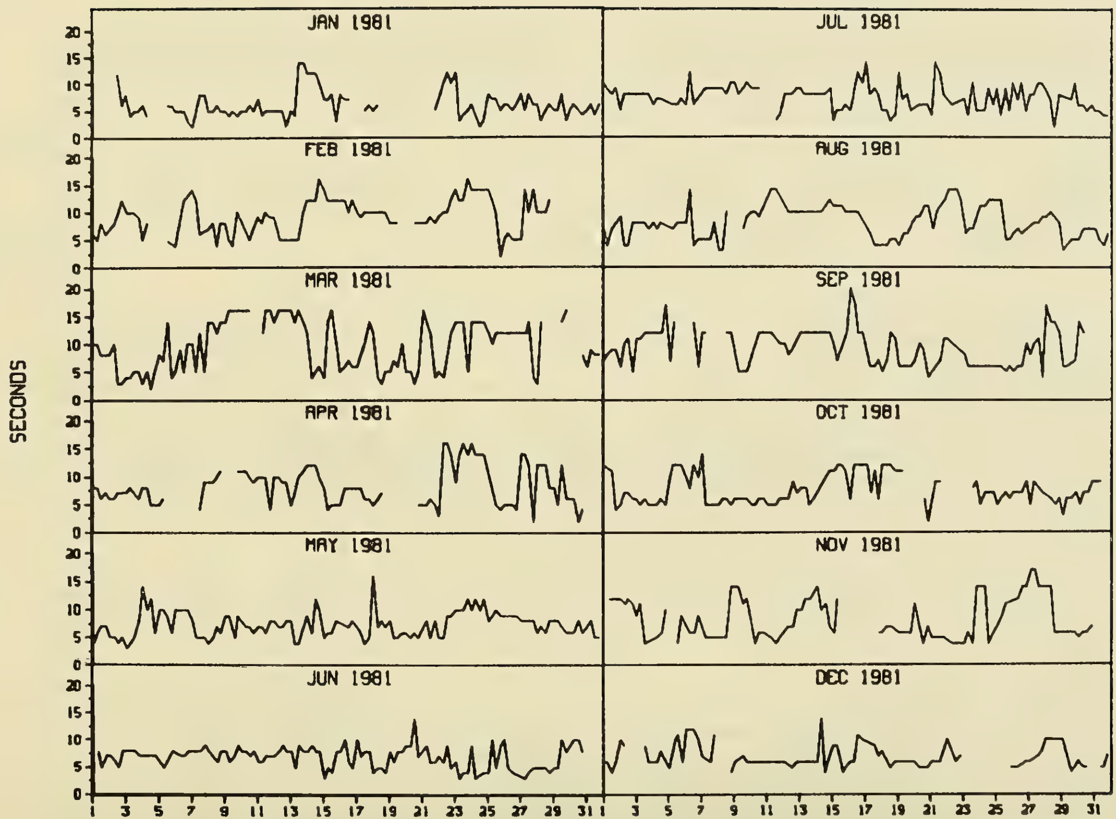


Figure B23. 1981 time history of wave period for gage 615

Table B20

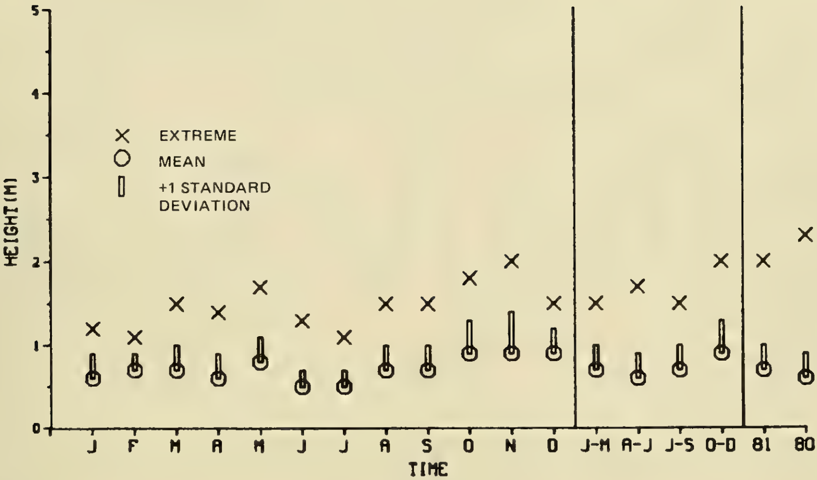
1981 Wave Statistics for Gage 615

Month	Mean Height, m	Standard Deviation Height, m	Mean Period	Standard Deviation Period	Extreme Height, m	Date	Number Observations
Jan	0.6	0.3	6.1	2.5	1.2	21	97
Feb	0.7	0.2	9.2	3.1	1.1	2	99
Mar	0.7	0.3	9.6	4.4	1.5	23	112
Apr	0.6	0.3	8.3	3.4	1.4	14	96
May	0.8	0.3	7.4	2.3	1.7	4	120
Jun	0.5	0.2	6.9	2.0	1.3	30	110
Jul	0.5	0.2	7.4	2.3	1.1	15	110
Aug	0.7	0.3	8.1	2.9	1.5	21	102
Sep	0.7	0.3	9.3	3.4	1.5	23	94
Oct	0.9	0.4	7.5	2.6	1.8	16	104
Nov	0.9	0.5	8.3	3.6	2.0	14	90
Dec	0.9	0.3	6.8	2.2	1.5	5	87
Jan-Mar	0.7	0.3	8.4	3.8	1.5	Mar	308
Apr-Jun	0.6	0.3	7.5	2.6	1.7	May	326
Jul-Sep	0.7	0.3	8.2	2.9	1.5	Aug	306
Oct-Dec	0.9	0.4	7.5	2.9	2.0	Nov	282
Annual	0.7	0.3	7.9	3.1	2.0	Nov	1,221

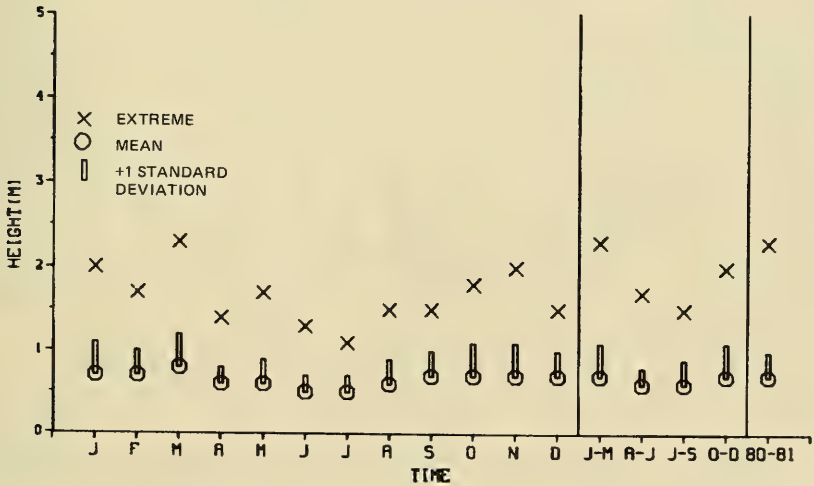
Table B21

1980 Plus 1981 Wave Statistics for Gage 615

Month	Mean Height, m	Standard Deviation Height, m	Mean Period	Standard Deviation Period	Extreme Height, m	Date	Number Observations
Jan	0.7	0.4	6.4	2.6	2.0	1980	126
Feb	0.7	0.3	9.1	3.1	1.7	1980	142
Mar	0.8	0.4	9.8	4.0	2.3	1980	189
Apr	0.6	0.2	8.7	3.4	1.4	1981	168
May	0.6	0.3	7.9	2.9	1.7	1981	207
Jun	0.5	0.2	7.1	2.1	1.3	1981	167
Jul	0.5	0.2	7.5	2.7	1.1	1981	178
Aug	0.6	0.3	8.2	3.1	1.5	1981	158
Sep	0.7	0.3	9.7	3.4	1.5	1981	138
Oct	0.7	0.4	8.6	3.0	1.8	1981	221
Nov	0.7	0.4	8.8	3.7	2.0	1981	208
Dec	0.7	0.3	7.3	3.1	1.5	1981	189
Jan-Mar	0.7	0.4	8.6	3.7	2.3	Mar 1980	457
Apr-Jun	0.6	0.2	7.9	2.9	1.7	May 1981	542
Jul-Sep	0.6	0.3	8.4	3.2	1.5	Aug 1981	474
Oct-Dec	0.7	0.4	8.2	3.4	2.0	Nov 1981	619
Annual	0.7	0.3	8.3	3.3	2.3	Mar 1980	2,091

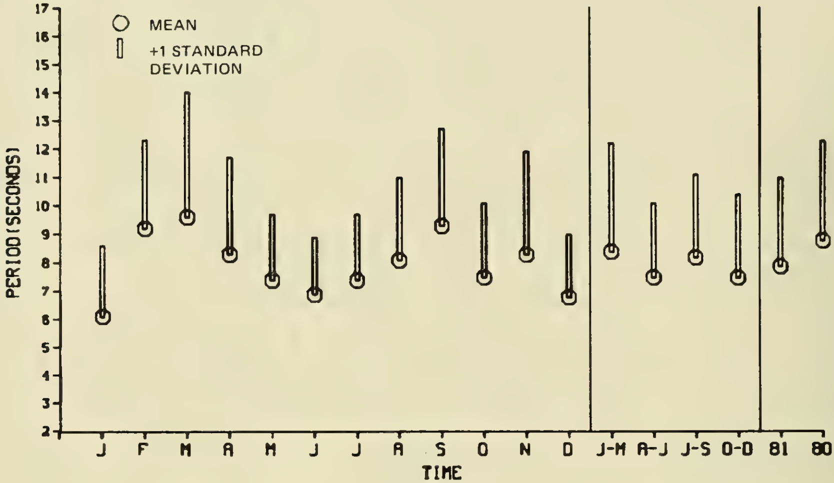


a. 1981

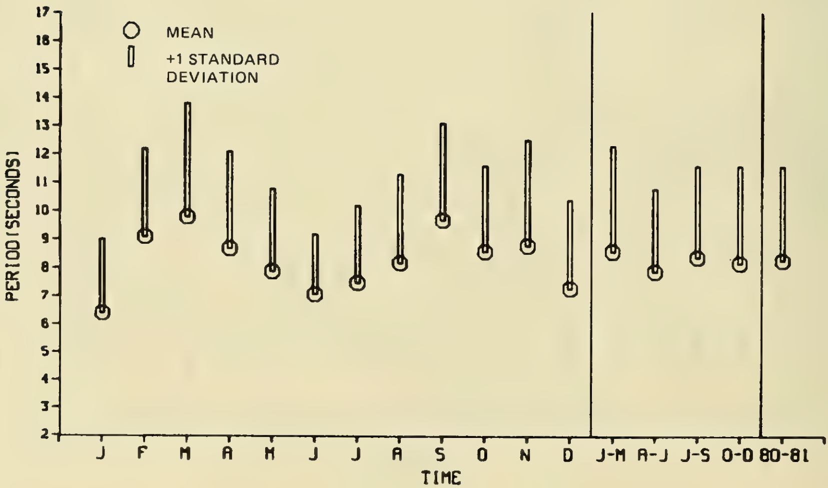


b. 1980 plus 1981

Figure 24. Monthly, seasonal, and annual extreme, mean, and standard deviation of wave height for gage 615



a. 1981



b. 1980 plus 1981

Figure B25. Monthly, seasonal, and annual mean and standard deviation of peak spectral wave period for gage 615

Table B22

1981 Annual and Seasonal Joint Distribution of Wave Height

Versus Peak Period for Gage 615

ANNUAL
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	4	5	11	27	30	33	61	29	29	6	20	27	1	283
.50 - .99	3	16	47	97	72	38	52	33	48	10	43	29	1	489
1.00 - 1.49	.	.	7	39	52	21	10	11	16	11	23	15	3	208
1.50 - 1.99	.	.	.	1	5	2	.	1	2	3	5	3	.	22
2.00 - 2.49	.	.	.	.	.	.	.	.	1	.	.	.	.	1
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	7	21	65	164	159	94	123	74	96	30	91	74	5	

SEASONAL JAN-MAR
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	6	10	13	45	32	19	45	.	19	.	19	32	.	240
.50 - .99	10	29	39	117	45	19	52	23	78	.	91	88	.	591
1.00 - 1.49	.	.	16	42	13	6	6	6	16	.	16	36	.	157
1.50 - 1.99	.	.	.	3	.	.	.	.	.	.	.	3	.	6
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	16	39	68	207	90	44	103	29	113	0	126	159	0	

SEASONAL APR-JUN
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	3	3	.	31	43	58	101	43	6	.	15	34	.	337
.50 - .99	3	15	67	113	64	58	89	43	61	12	12	9	.	546
1.00 - 1.49	.	.	3	18	15	6	18	9	21	3	9	3	.	105
1.50 - 1.99	.	.	.	.	3	.	.	.	3	.	.	.	.	6
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	6	18	70	162	125	122	208	95	91	15	36	46	0	

(Continued)

SEASONAL JUL-SEP
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	3	7	10	7	20	33	82	49	72	10	26	23	3	345
.50 - .99	.	13	46	85	59	39	56	42	36	13	56	3	3	451
1.00 - 1.49	.	.	3	20	56	26	7	7	10	20	26	13	7	195
1.50 - 1.99	.	.	.	.	7	.	.	.	.	3	.	3	.	13
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	3	20	59	112	142	98	145	98	118	46	108	42	13	

SEASONAL OCT-DEC
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	4	.	25	25	25	18	11	21	18	14	18	18	.	197
.50 - .99	.	4	32	71	124	32	7	21	14	14	11	14	.	344
1.00 - 1.49	.	.	4	82	135	50	7	21	14	21	43	7	7	391
1.50 - 1.99	.	.	.	.	11	7	.	4	4	11	21	7	.	65
2.00 - 2.49	.	.	.	.	.	.	.	.	4	.	.	.	.	4
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	4	4	61	178	295	107	25	67	54	60	93	46	7	

Table B23

1981 Monthly Joint Distribution of Wave Height

Versus Peak Period for Gage 615

MONTH JAN
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	21	21	21	93	82	41	72	.	.	.	21	.	.	372
.50 - .99	10	41	52	155	82	31	21	.	31	.	41	21	.	485
1.00 - 1.49	.	.	21	82	21	10	.	.	10	.	.	.	.	144
1.50 - 1.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	31	62	94	330	185	82	93	0	41	0	62	21	0	

MONTH FEB
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	.	10	20	10	10	40	.	51	.	20	10	.	171
.50 - .99	10	.	20	111	30	20	101	61	162	.	121	101	.	737
1.00 - 1.49	.	.	.	20	.	.	10	10	10	.	30	10	.	90
1.50 - 1.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	10	0	30	151	40	30	151	71	223	0	171	121	0	

MONTH MAR
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	9	9	27	9	9	27	.	9	.	18	80	.	197
.50 - .99	9	45	45	89	27	9	36	9	45	.	107	134	.	555
1.00 - 1.49	.	.	27	27	18	9	9	9	27	.	18	89	.	233
1.50 - 1.99	.	.	.	9	.	.	.	.	.	.	.	9	.	18
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	9	54	81	152	54	27	72	18	81	0	143	312	0	

(Continued)

(Sheet 1 of 4)

MONTH APR
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	10	.	.	31	73	63	83	31	.	.	52	94	.	437
.50 - .99	10	10	63	115	31	.	42	42	73	42	.	31	.	459
1.00 - 1.49	.	.	.	21	10	10	10	.	21	10	21	.	.	103
1.50 - 1.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	20	10	63	167	114	73	135	73	94	52	73	125	0	

MONTH MAY
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	.	.	8	8	25	67	17	.	.	.	8	.	133
.50 - .99	.	8	50	125	108	108	92	58	83	.	33	.	.	665
1.00 - 1.49	.	.	8	33	33	8	33	25	25	.	8	8	.	181
1.50 - 1.99	.	.	.	.	8	.	.	.	8	.	.	.	.	16
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	8	58	166	157	141	192	100	116	0	41	16	0	

MONTH JUN
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	9	.	55	55	91	155	82	18	.	.	9	.	474
.50 - .99	.	27	91	100	45	55	127	27	27	.	.	.	.	499
1.00 - 1.49	.	.	.	.	.	.	9	.	18	.	.	.	.	27
1.50 - 1.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	36	91	155	100	146	291	109	63	0	0	9	0	

(Continued)

(Sheet 2 of 4)

MONTH JUL
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 10.9	11.0- 11.9	12.0- 13.9	14.0- 16.9	17.0- LONGER	TOTAL
0.00 - .49	9	.	9	9	36	36	136	118	64	.	27	18	.	462
.50 - .99	.	27	45	100	73	36	91	55	27	.	9	.	.	463
1.00 - 1.49	.	.	9	27	18	.	9	.	9	.	.	.	.	72
1.50 - 1.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	9	27	63	136	127	72	236	173	100	0	36	18	0	

MONTH AUG
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 10.9	11.0- 11.9	12.0- 13.9	14.0- 16.9	17.0- LONGER	TOTAL
0.00 - .49	.	20	.	10	.	29	88	10	88	.	10	29	.	284
.50 - .99	.	10	88	108	10	59	39	39	59	29	39	.	.	480
1.00 - 1.49	.	.	.	.	59	49	10	20	10	29	20	20	.	217
1.50 - 1.99	.	.	.	.	.	.	.	.	.	10	.	10	.	20
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	30	88	118	69	137	137	69	157	68	69	59	0	

MONTH SEP
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 10.9	11.0- 11.9	12.0- 13.9	14.0- 16.9	17.0- LONGER	TOTAL
0.00 - .49	.	.	21	.	21	32	11	11	64	32	43	21	11	267
.50 - .99	.	.	.	43	96	21	32	32	21	11	128	11	11	406
1.00 - 1.49	.	.	.	32	96	32	.	.	11	32	64	21	21	309
1.50 - 1.99	.	.	.	.	21	.	.	.	.	.	.	.	.	21
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	0	21	75	234	85	43	43	96	75	235	53	43	

(Continued)

MONTH OCT
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS)													TOTAL
	1.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 10.9	11.0- 11.9	12.0- 13.9	14.0- 16.9	17.0- LONGER	
0.00 - .49	10	.	10	38	19	19	10	29	19	10	38	10	.	212
.50 - .99	.	10	.	87	87	29	10	29	.	19	29	.	.	300
1.00 - 1.49	.	.	.	96	115	96	19	38	10	29	38	.	.	441
1.50 - 1.99	.	.	.	.	19	.	.	.	.	10	19	.	.	48
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	10	10	10	221	240	144	39	96	29	68	124	10	0	

MONTH NOV
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS)													TOTAL
	1.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 10.9	11.0- 11.9	12.0- 13.9	14.0- 16.9	17.0- LONGER	
0.00 - .49	.	.	56	33	22	11	.	11	11	22	11	44	.	221
.50 - .99	.	.	67	78	100	33	.	22	.	11	.	33	.	344
1.00 - 1.49	.	.	.	22	100	22	.	.	11	33	67	22	22	299
1.50 - 1.99	.	.	.	.	11	22	.	11	11	11	33	22	.	121
2.00 - 2.49	.	.	.	.	.	.	.	.	11	.	.	.	.	11
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	0	123	133	233	88	0	44	44	77	111	121	22	

MONTH DEC
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS)													TOTAL
	1.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 10.9	11.0- 11.9	12.0- 13.9	14.0- 16.9	17.0- LONGER	
0.00 - .49	.	.	11	.	34	23	23	23	23	11	.	.	.	148
.50 - .99	.	.	34	46	194	34	11	11	46	11	11	11	.	409
1.00 - 1.49	.	.	11	126	194	23	.	23	23	.	23	.	.	423
1.50 - 1.99	.	.	.	.	.	.	.	.	.	11	11	.	.	22
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	0	56	172	422	80	34	57	92	33	45	11	0	

(Sheet 4 of 4)

Table B24

1980 Plus 1981 Annual and Seasonal Joint Distribution of Wave Height Versus Peak Period for Gage 615

ANNUAL
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	3	3	15	27	27	31	49	36	29	14	38	38	6	316
.50 - .99	2	16	49	92	77	41	42	35	46	23	35	33	1	492
1.00 - 1.49	.	.	5	26	36	19	8	9	11	13	21	17	2	167
1.50 - 1.99	.	.	.	.	4	1	.	2	1	4	3	4	.	19
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	1	.	1
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	5	19	69	145	144	92	99	82	87	54	97	93	9	

SEASONAL JAN-MAR
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	4	7	13	37	31	24	31	7	22	4	20	24	.	224
.50 - .99	7	26	33	107	53	22	37	24	61	20	70	83	.	543
1.00 - 1.49	.	.	11	35	15	20	7	4	18	15	26	39	.	190
1.50 - 1.99	.	.	.	2	4	2	.	9	.	4	2	13	.	36
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	2	4	.	6
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	11	33	57	181	103	68	75	44	101	43	120	163	0	

SEASONAL APR-JUN
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	2	4	7	31	31	50	83	52	20	6	42	44	6	378
.50 - .99	2	11	66	113	68	52	66	50	54	33	13	13	2	543
1.00 - 1.49	.	.	2	15	11	4	11	6	13	4	9	2	.	77
1.50 - 1.99	.	.	.	.	2	.	.	.	2	.	.	.	.	4
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	4	15	75	159	112	106	160	108	89	43	64	59	8	

(Continued)

SEASONAL JUL-SEP
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS)													TOTAL
	1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	
0.00 - .49	2	4	25	21	27	36	72	59	57	21	38	42	13	417
.50 - .99	.	15	49	80	55	46	44	32	32	15	44	25	2	439
1.00 - 1.49	.	.	2	13	36	21	6	8	6	13	17	8	4	134
1.50 - 1.99	.	.	.	.	4	.	.	.	.	2	.	2	.	8
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	2	19	76	114	122	103	122	99	95	51	99	77	19	

SEASONAL OCT-DEC
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS)													TOTAL
	1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	
0.00 - .49	5	.	15	21	21	15	16	27	21	24	47	40	6	258
.50 - .99	2	13	47	73	121	42	21	32	39	23	19	21	2	455
1.00 - 1.49	.	.	5	39	73	31	6	16	8	21	29	19	5	252
1.50 - 1.99	.	.	.	.	5	3	.	2	2	8	10	3	.	33
2.00 - 2.49	.	.	.	.	.	.	.	.	2	.	.	.	.	2
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	7	13	67	133	220	91	43	77	72	76	105	83	13	

Table B25

1980 Plus 1981 Monthly Joint Distribution of Wave Height

Versus Peak Period for Gage 615

MONTH JAN
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	16	16	16	71	71	56	56	8	8	.	16	.	.	334
.50 - .99	8	40	56	143	95	32	16	.	24	.	32	16	.	462
1.00 - 1.49	.	.	16	79	24	16	8	.	24	8	.	8	.	183
1.50 - 1.99	.	.	.	.	.	.	.	8	.	8	.	.	.	16
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	8	.	8
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	24	56	88	293	190	104	80	16	56	16	48	32	0	

MONTH FEB
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	.	7	21	7	14	28	7	35	7	28	14	.	168
.50 - .99	7	7	14	106	35	28	70	56	120	35	92	85	.	655
1.00 - 1.49	.	.	.	14	14	28	7	7	14	21	28	14	.	147
1.50 - 1.99	.	.	.	.	14	7	.	7	.	.	.	.	.	28
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	7	7	21	141	70	77	105	77	169	63	148	113	0	

MONTH MAR
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	5	16	26	21	11	16	5	21	5	16	48	.	190
.50 - .99	5	32	32	85	37	11	26	16	42	21	79	127	.	513
1.00 - 1.49	.	.	16	21	11	16	5	5	16	16	42	79	.	227
1.50 - 1.99	.	.	.	5	.	.	.	11	.	5	5	32	.	58
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	5	5	.	10
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	5	37	64	137	69	38	47	37	79	47	147	291	0	

(Continued)

(Sheet 1 of 4)

Table B25 (Continued)

MONTH APR
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	6	.	6	30	48	48	60	24	12	12	54	83	6	389
.50 - .99	6	6	42	119	60	12	42	36	60	101	18	24	6	532
1.00 - 1.49	.	.	.	18	6	6	6	.	12	12	24	.	.	84
1.50 - 1.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	12	6	48	167	114	66	108	60	84	125	96	107	12	

MONTH MAY
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	.	14	24	14	34	68	29	19	5	68	39	10	324
.50 - .99	.	10	53	111	87	82	63	48	58	5	19	14	.	550
1.00 - 1.49	.	.	5	24	24	5	19	14	14	.	5	5	.	115
1.50 - 1.99	.	.	.	.	5	.	.	.	5	.	.	.	.	10
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	10	72	159	130	121	150	91	96	10	92	58	10	

MONTH JUN
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	12	.	42	36	72	126	108	30	.	.	12	.	438
.50 - .99	.	18	108	108	54	54	96	66	42	.	.	.	.	546
1.00 - 1.49	.	.	.	.	.	.	6	.	12	.	.	.	.	18
1.50 - 1.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	30	108	150	90	126	228	174	84	0	0	12	0	

(Continued)

(Sheet 2 of 4)

MONTH JUL
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	6	.	39	6	39	51	101	96	45	11	34	39	6	473
.50 - .99	.	22	62	118	62	51	79	34	22	.	6	11	.	467
1.00 - 1.49	.	.	6	17	11	11	11	.	6	.	.	.	.	62
1.50 - 1.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	6	22	107	141	112	113	191	130	73	11	40	50	6	

MONTH AUG
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	13	19	57	25	32	89	38	70	13	25	57	13	451
.50 - .99	.	13	70	76	25	44	25	38	44	38	25	.	.	398
1.00 - 1.49	.	.	.	.	38	32	6	13	6	19	13	13	.	140
1.50 - 1.99	.	.	.	.	.	.	.	.	.	6	.	6	.	12
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	26	89	133	88	108	120	89	120	76	63	76	13	

MONTH SEP
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	.	14	.	14	22	14	36	58	43	58	29	22	310
.50 - .99	.	7	7	36	80	43	22	22	29	7	116	72	7	448
1.00 - 1.49	.	.	.	22	65	22	.	14	7	22	43	14	14	223
1.50 - 1.99	.	.	.	.	14	.	.	.	.	.	.	.	.	14
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	7	21	58	173	87	36	72	94	72	217	115	43	

(Continued)

Table B25 (Concluded)

MONTH OCT
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	5	.	5	23	9	9	27	32	23	23	68	41	5	270
.50 - .99	.	9	5	68	95	27	27	50	72	32	32	14	5	436
1.00 - 1.49	.	.	.	50	72	54	14	23	5	36	18	.	.	272
1.50 - 1.99	.	.	.	.	9	.	.	.	.	9	9	.	.	27
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	5	9	10	141	185	90	68	105	100	100	127	55	10	

MONTH NOV
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	10	.	24	14	24	19	10	38	19	24	53	38	.	273
.50 - .99	5	5	53	77	125	58	14	24	14	19	14	43	.	456
1.00 - 1.49	.	.	.	10	43	14	5	.	5	14	48	58	14	211
1.50 - 1.99	.	.	.	.	5	10	.	5	5	5	14	10	.	54
2.00 - 2.49	.	.	.	.	.	.	.	.	5	.	.	.	.	5
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	15	5	82	101	197	101	29	67	48	62	129	149	14	

MONTH DEC
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	.	16	26	32	16	11	11	21	26	16	42	16	233
.50 - .99	.	26	84	74	148	42	21	21	26	16	16	5	.	479
1.00 - 1.49	.	.	16	58	106	21	.	26	16	11	21	.	.	275
1.50 - 1.99	.	.	.	.	.	.	.	.	.	11	5	.	.	16
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	26	116	158	286	79	32	58	63	64	58	47	16	

(Sheet 4 of 4)

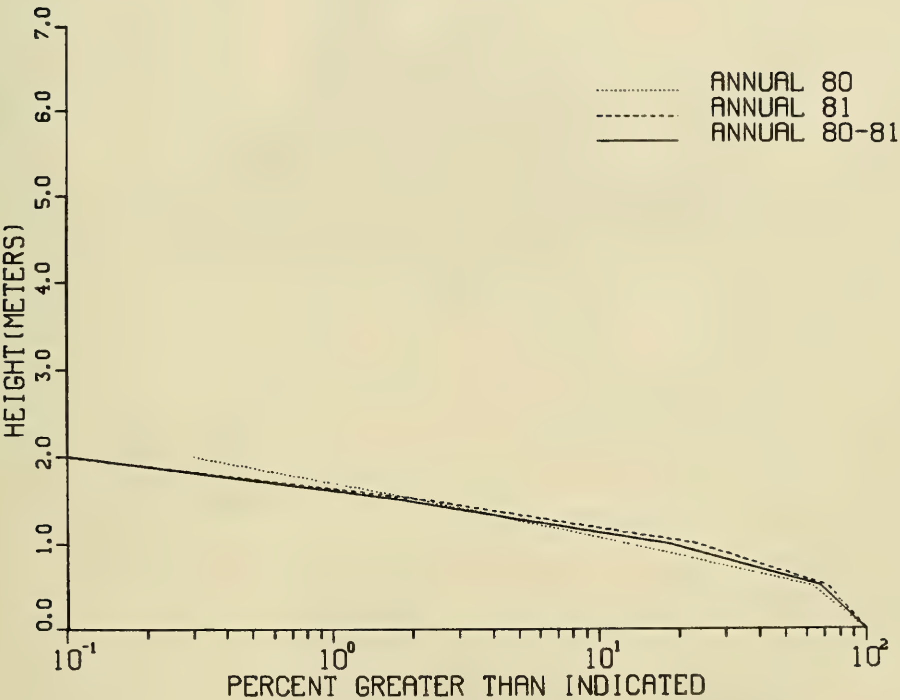
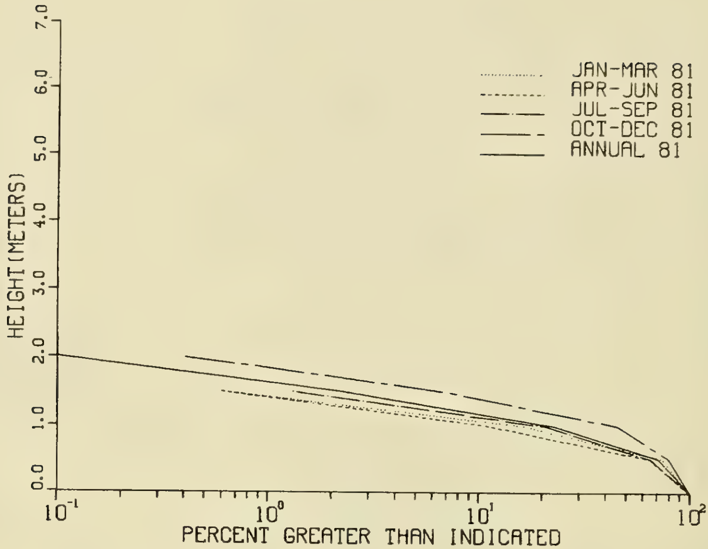
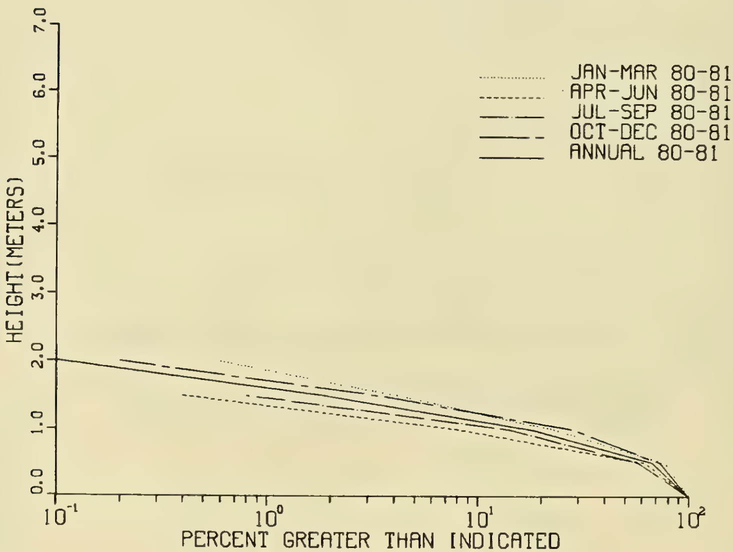


Figure B26. 1981 and 1980 plus 1981 annual cumulative distribution of wave height for gage 615

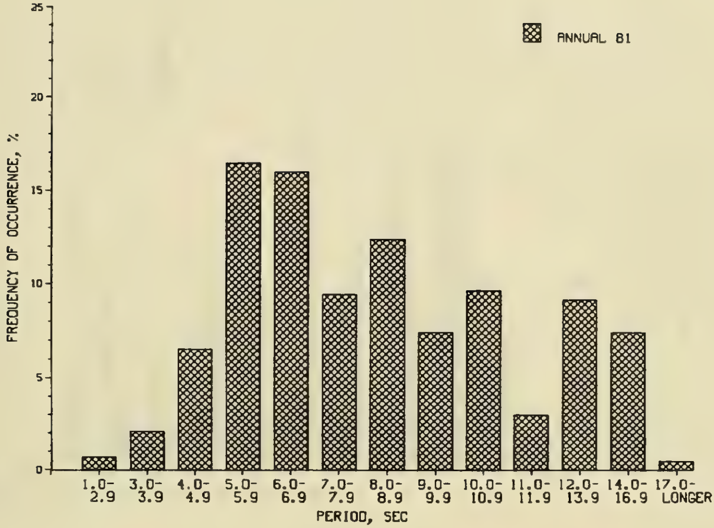


a. 1981

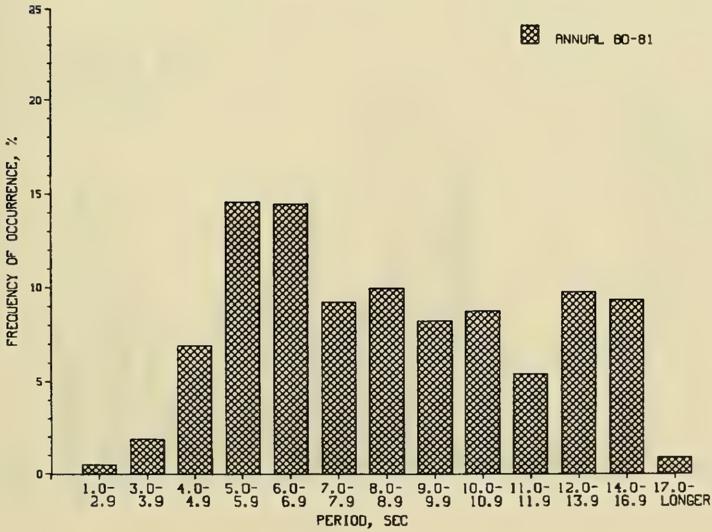


b. 1980 plus 1981

Figure B27. Seasonal and annual cumulative distribution of wave height for gage 615

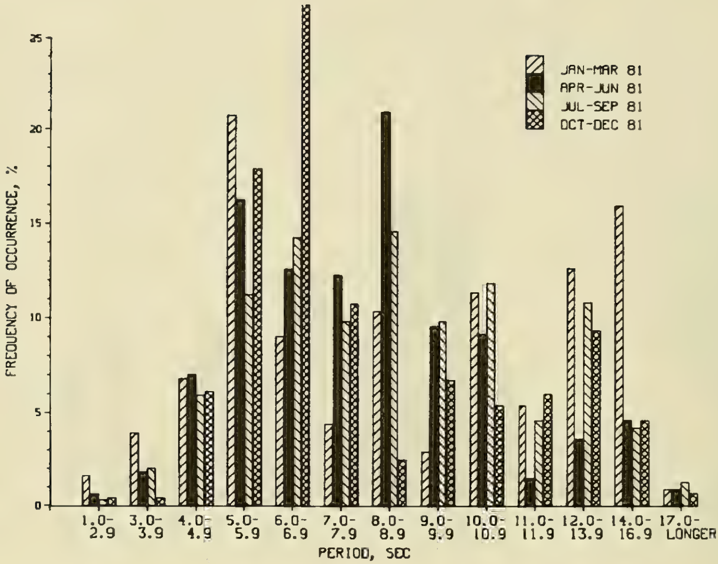


a. 1981

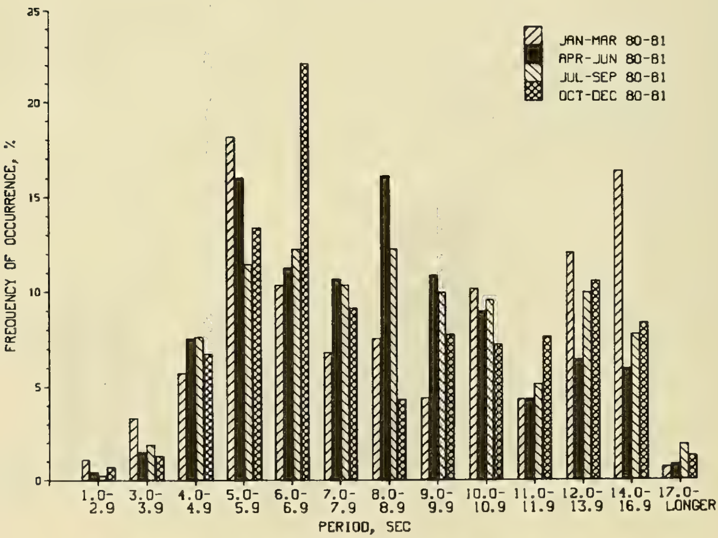


b. 1980 plus 1981

Figure B28. Annual peak spectral wave period distribution for gage 615



a. 1981



b. 1980 plus 1981

Figure B29. Seasonal peak spectral wave period distribution for gage 615

Table B26

Persistence of 1981 Wave Heights of Gage 615

	Consecutive Day(s)																										
Height, m	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	28	33
0.5	40	36	31	27	22	19	16	12		9			8	7	6				4		3					2	1
1.0	49	27	20	10	9	7	2		1																		
1.5	9	6		2	1																						
2.0	1																										
2.5																											
3.0																											
3.5																											
4.0																											

Table B27

Persistence of 1980 Plus 1981 Wave Heights for Gage 615

Height	Consecutive Day(s) or longer																								
m	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1.0	33	21	16	9	7		2		1																
1.5	10	5		2	1																				
2.0	2	1																							
2.5																									
3.0																									
3.5																									
4.0																									

Table B28

1981 Wave Gage History for Gage 610

Type of Gage and Location	Coordinates	Beginning of Proper Operation	End of Proper Operation	Explanation	Gage Length m	Gage Range m, MSL	Water Depth* m, MSL	Distance from Baseline, m
Buoy-accelerometer, FRF, Duck, N. C.	36°11.1 N × 75°44.7' W	Nov 78	13 Jan 81	Semiannual servicing; buoy replaced	--	Continuous	7	0.6
		13 Jan 81	13 Feb 81	Mooring failure; buoy recovered on beach				
		25 Feb 81	25 Aug 81	Mooring failure				
		1 Sep 81						

* Depth determined from Oct 1980 bathymetric survey.

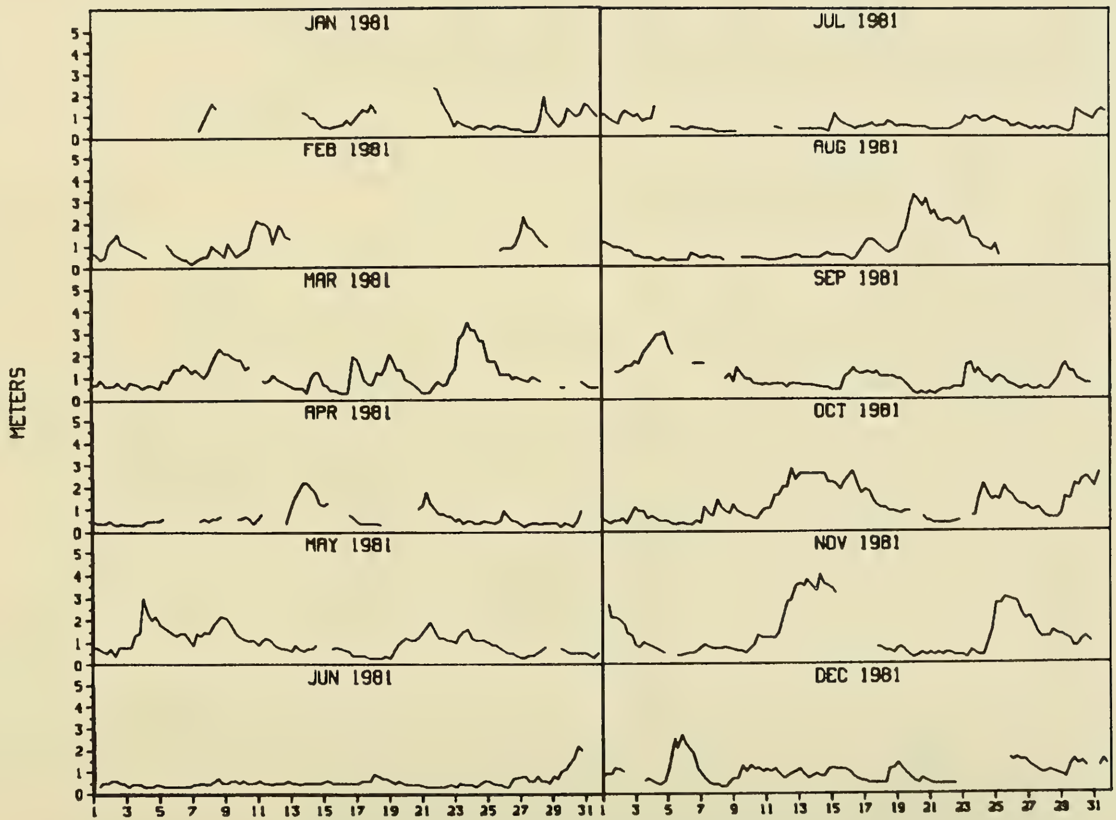


Figure B30. 1981 time history of wave height for gage 610

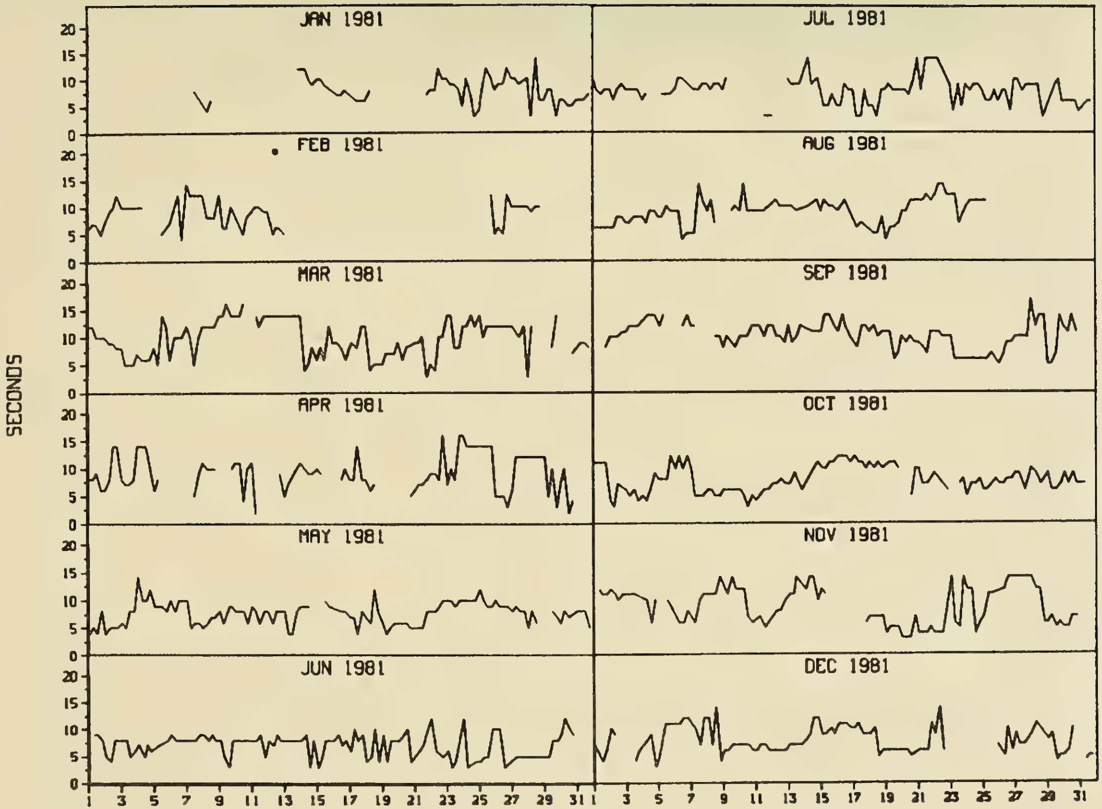


Figure B31. 1981 time history of wave period for gage 610

Table B29

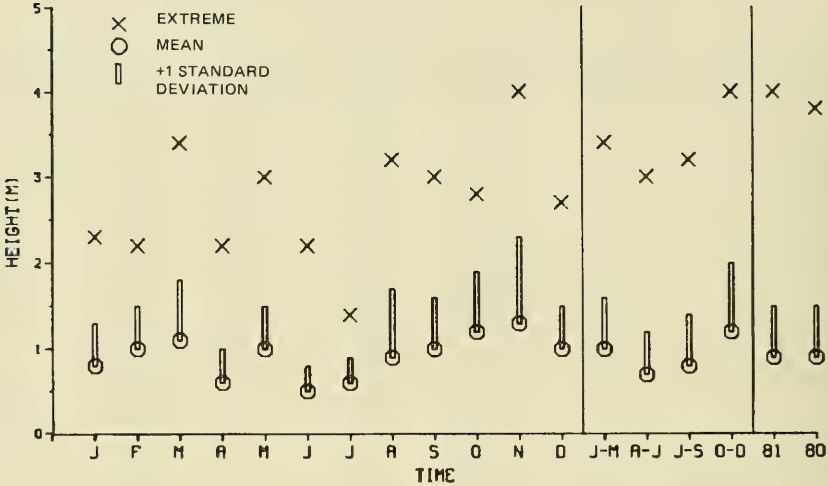
1981 Wave Statistics for Gage 610

Month	Mean Height, m	Standard Deviation Height, m	Mean Period	Standard Deviation Period	Extreme Height, m	Date	Number Observations
Jan	0.8	0.5	8.0	2.5	2.3	21	65
Feb	1.0	0.5	8.7	2.5	2.2	27	53
Mar	1.1	0.7	9.7	3.2	3.4	23	108
Apr	0.6	0.4	9.1	3.3	2.2	13	87
May	1.0	0.5	7.7	2.0	3.0	4	114
Jun	0.5	0.3	7.2	2.1	2.2	30	111
Jul	0.6	0.3	7.8	2.3	1.4	4	101
Aug	0.9	0.8	9.0	2.4	3.2	20	82
Sep	1.0	0.6	10.2	2.5	3.0	4	105
Oct	1.2	0.7	7.9	2.3	2.8	12	112
Nov	1.3	1.0	8.9	3.4	4.0	14	94
Dec	1.0	0.5	7.9	2.5	2.7	5	101
Jan-Mar	1.0	0.6	9.0	3.0	3.4	Mar	226
Apr-Jun	0.7	0.5	7.9	2.6	3.0	May	312
Jul-Sep	0.8	0.6	9.0	2.6	3.2	Aug	288
Oct-Dec	1.2	0.8	8.2	2.8	4.0	Nov	307
Annual	0.9	0.6	8.5	2.8	4.0	Nov	1,133

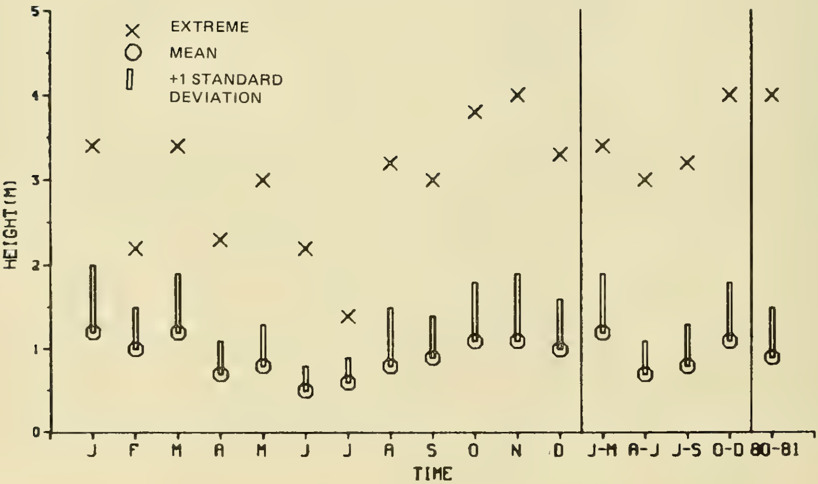
Table B30

1980 Plus 1981 Wave Statistics for Gage 610

Month	Mean Height, m	Standard Deviation Height, m	Mean Period	Standard Deviation Period	Extreme Height, m	Date	Number Observations
Jan	1.2	0.8	8.6	2.6	3.4	1980	121
Feb	1.0	0.5	9.2	2.5	2.2	1981	70
Mar	1.2	0.7	10.1	3.0	3.4	1980	164
Apr	0.7	0.4	9.4	3.0	2.3	1980	159
May	0.8	0.5	8.0	2.3	3.0	1981	195
Jun	0.5	0.3	7.1	2.1	2.2	1981	130
Jul	0.6	0.3	7.8	2.3	1.4	1981	101
Aug	0.8	0.7	8.7	2.2	3.2	1981	115
Sep	0.9	0.5	10.2	2.5	3.0	1981	148
Oct	1.1	0.7	8.5	2.7	3.8	1980	217
Nov	1.1	0.8	9.0	3.3	4.0	1981	213
Dec	1.0	0.6	8.3	2.9	3.3	1980	207
Jan-Mar	1.2	0.7	9.4	2.9	3.4	Jan 1980	355
Apr-Jun	0.7	0.4	8.2	2.6	3.0	May 1981	484
Jul-Sep	0.8	0.5	9.1	2.6	3.2	Aug 1981	364
Oct-Dec	1.1	0.7	8.6	3.0	4.0	Nov 1981	637
Annual	0.9	0.6	8.7	2.8	4.0	Nov 1981	1,840

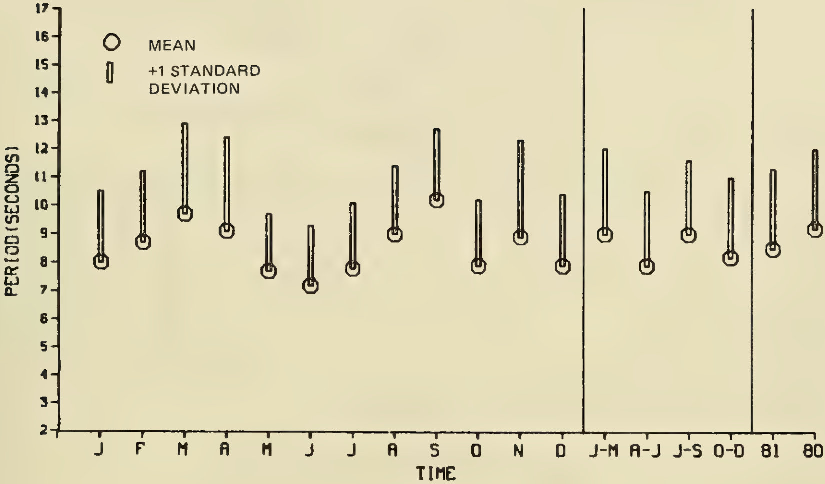


a. 1981

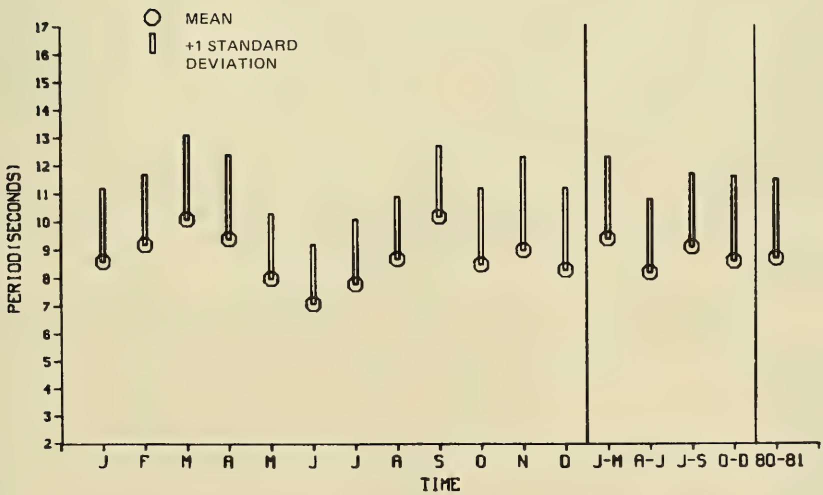


b. 1980 plus 1981

Figure B32. Monthly, seasonal, and annual extreme, mean, and standard deviation of wave height for gage 610



a. 1981



b. 1980 plus 1981

Figure B33. Monthly, seasonal, and annual mean and standard deviation of wave period for gage 610

Table B31

1981 Annual and Seasonal Joint Distribution of Wave Height

Versus Peak Period for Gage 610

ANNUAL
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	6	6	11	14	21	46	47	32	9	21	18	1	232
.50 - .99	2	16	28	49	49	27	74	43	51	28	23	19	.	409
1.00 - 1.49	.	.	4	21	47	21	22	15	30	9	19	7	.	195
1.50 - 1.99	.	.	1	7	16	6	4	6	9	5	10	8	.	72
2.00 - 2.49	.	.	.	1	.	11	2	4	8	9	10	6	.	51
2.50 - 2.99	.	.	.	.	1	4	4	1	1	4	4	4	.	23
3.00 - 3.49	.	.	.	.	.	.	1	2	.	3	4	2	.	12
3.50 - 3.99	.	.	.	.	.	.	.	.	2	2	.	2	.	6
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	1	.	1
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	2	22	39	89	127	90	153	118	133	69	91	67	1	

SEASONAL JAN-MAR
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	.	9	4	9	4	18	40	22	.	27	9	.	142
.50 - .99	.	22	4	40	44	35	62	35	75	.	62	35	.	414
1.00 - 1.49	.	.	9	31	49	13	13	13	40	.	58	13	.	239
1.50 - 1.99	.	.	4	4	22	9	13	9	31	.	4	27	.	123
2.00 - 2.49	.	.	.	4	.	4	4	4	13	.	9	9	.	47
2.50 - 2.99	.	.	.	.	.	.	4	.	.	.	4	9	.	17
3.00 - 3.49	.	.	.	.	.	.	4	.	.	.	9	.	.	13
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	22	26	83	124	65	118	101	181	0	173	102	0	

SEASONAL APR-JUN
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	6	10	22	32	35	83	29	26	.	35	22	.	300
.50 - .99	6	19	45	80	22	16	141	64	38	13	.	22	.	466
1.00 - 1.49	.	.	.	16	26	3	45	19	35	.	3	.	.	147
1.50 - 1.99	.	.	.	6	10	6	3	16	3	.	3	.	.	47
2.00 - 2.49	.	.	.	.	.	6	3	3	13	3	3	.	.	31
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	3	.	3
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	6	25	55	124	90	66	275	131	115	16	44	47	0	

(Continued)

Table B31 (Concluded)

SEASONAL JUL-SEP
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	10	.	10	.	24	63	108	66	28	3	28	3	343
.50 - .99	.	10	17	31	45	24	63	38	59	42	28	14	.	371
1.00 - 1.49	.	.	.	10	52	14	17	7	28	14	17	7	.	166
1.50 - 1.99	.	.	.	3	10	.	.	.	3	7	21	7	.	51
2.00 - 2.49	.	.	.	.	.	.	.	.	.	7	21	7	.	35
2.50 - 2.99	.	.	.	.	.	3	.	.	.	7	.	7	.	17
3.00 - 3.49	.	.	.	.	.	.	.	7	.	3	.	3	.	13
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	20	17	54	107	65	143	160	156	108	90	73	3	

SEASONAL OCT-DEC
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	7	7	7	13	16	13	13	13	7	20	10	.	126
.50 - .99	.	13	39	42	81	36	26	33	39	52	13	10	.	384
1.00 - 1.49	.	.	10	29	62	52	10	20	20	20	10	10	.	243
1.50 - 1.99	.	.	.	13	23	10	3	.	3	13	10	3	.	78
2.00 - 2.49	.	.	.	.	.	29	.	7	7	23	7	10	.	83
2.50 - 2.99	.	.	.	.	3	10	13	3	3	10	13	.	.	55
3.00 - 3.49	.	.	.	.	.	.	.	.	.	7	7	.	.	14
3.50 - 3.99	.	.	.	.	.	.	.	.	7	7	.	7	.	21
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	3	.	3
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	20	56	91	182	153	65	76	92	139	80	53	0	

Table B32

1981 Monthly Joint Distribution of Wave Height

Versus Peak Period for Gage 610

MONTH JAN

PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	.	15	15	15	.	46	77	62	.	31	.	.	261
.50 - .99	.	46	.	15	31	62	46	46	92	.	31	.	.	369
1.00 - 1.49	.	.	.	15	123	.	15	.	31	.	46	.	.	230
1.50 - 1.99	.	.	15	.	46	15	15	.	.	.	.	15	.	106
2.00 - 2.49	.	.	.	.	.	15	15	.	.	.	.	.	.	30
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	46	30	45	215	92	137	123	185	0	108	15	0	

MONTH FEB

PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	.	19	.	.	19	.	.	.	.	57	19	.	114
.50 - .99	.	.	.	75	57	38	38	.	113	.	75	.	.	396
1.00 - 1.49	.	.	.	38	38	19	19	57	57	.	38	.	.	266
1.50 - 1.99	.	.	.	19	19	.	19	19	75	.	.	.	.	151
2.00 - 2.49	.	.	.	.	.	.	.	19	57	.	.	.	.	76
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	0	19	132	114	76	76	95	302	0	170	19	0	

MONTH MAR

PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	.	.	.	9	.	9	37	9	.	9	9	.	82
.50 - .99	.	19	9	37	46	19	83	46	46	.	74	74	.	453
1.00 - 1.49	.	.	19	37	9	19	9	.	37	.	74	28	.	232
1.50 - 1.99	.	.	.	.	9	9	9	9	28	.	9	46	.	119
2.00 - 2.49	.	.	.	9	.	.	.	.	.	.	19	19	.	47
2.50 - 2.99	.	.	.	.	.	.	9	.	.	.	9	19	.	37
3.00 - 3.49	.	.	.	.	.	.	9	.	.	.	19	.	.	28
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	19	28	83	73	47	128	92	120	0	213	195	0	

(Continued)

(Sheet 1 of 4)

Table B32 (Continued)

MONTH APR
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	11	.	11	34	46	92	23	34	.	92	80	.	423
.50 - .99	23	11	23	46	23	11	57	34	69	46	.	80	.	423
1.00 - 1.49	.	.	.	23	11	11	11	23	11	.	.	.	.	90
1.50 - 1.99	.	.	.	.	.	23	.	11	.	.	.	.	.	34
2.00 - 2.49	.	.	.	.	.	.	.	.	11	11	.	.	.	22
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	23	22	23	80	68	91	160	91	125	57	92	160	0	

MONTH MAY
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	.	9	9	18	26	70	18	.	.	9	.	.	159
.50 - .99	.	.	53	61	35	18	96	79	35	.	.	.	.	377
1.00 - 1.49	.	.	.	26	61	.	96	26	88	.	9	.	.	306
1.50 - 1.99	.	.	.	18	26	.	9	35	9	.	.	.	.	97
2.00 - 2.49	.	.	.	.	.	18	9	.	18	.	9	.	.	54
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	9	.	9
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	0	62	114	140	62	280	158	150	0	27	9	0	

MONTH JUN
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	9	18	45	45	36	90	45	45	.	18	.	.	351
.50 - .99	.	45	54	126	9	18	252	72	18	.	.	.	.	594
1.00 - 1.49	.	.	.	.	.	.	18	9	.	.	.	.	.	27
1.50 - 1.99	.	.	.	.	.	.	.	.	.	.	9	.	.	9
2.00 - 2.49	.	.	.	.	.	.	.	9	9	.	.	.	.	18
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	54	72	171	54	54	360	135	72	0	27	0	0	

(Continued)

(Sheet 2 of 4)

Table B32 (Continued)

MONTH JUL
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	30	.	10	.	40	129	139	89	.	.	50	.	487
.50 - .99	.	30	30	50	50	20	129	69	.	.	.	.	.	378
1.00 - 1.49	.	.	.	20	59	10	30	10	10	.	.	.	.	139
1.50 - 1.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	60	30	80	109	70	288	218	99	0	0	50	0	

MONTH AUG
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	.	.	24	.	24	49	159	73	49	.	12	.	390
.50 - .99	.	.	24	37	37	24	37	12	49	73	.	12	.	305
1.00 - 1.49	.	.	.	.	61	24	.	.	12	12	.	.	.	109
1.50 - 1.99	.	.	.	.	12	.	.	.	.	.	24	12	.	48
2.00 - 2.49	.	.	.	.	.	.	.	.	.	24	37	12	.	73
2.50 - 2.99	.	.	.	.	.	12	.	.	.	24	.	.	.	36
3.00 - 3.49	.	.	.	.	.	.	.	24	.	12	.	.	.	36
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	0	24	61	110	84	86	195	134	194	61	48	0	

MONTH SEP
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	.	.	.	.	10	10	38	38	38	10	19	10	173
.50 - .99	.	.	.	10	48	29	19	29	124	57	76	29	.	421
1.00 - 1.49	.	.	.	10	38	10	19	10	57	29	48	19	.	240
1.50 - 1.99	.	.	.	10	19	.	.	.	10	19	38	10	.	106
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	29	10	.	39
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	19	.	19
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	10	.	10
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	0	0	30	105	49	48	77	229	143	201	116	10	

(Continued)

(Sheet 3 of 4)

Table B32 (Concluded)

MONTH OCT
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	.	.	.	.	27	36	9	27	9	18	.	.	126
.50 - .99	.	18	27	80	63	18	27	36	45	54	9	.	.	377
1.00 - 1.49	.	.	9	18	63	9	27	9	18	18	.	.	.	171
1.50 - 1.99	.	.	.	9	36	18	9	.	.	27	9	.	.	108
2.00 - 2.49	.	.	.	.	.	80	.	18	18	18	9	.	.	143
2.50 - 2.99	.	.	.	.	9	18	18	9	9	.	18	.	.	81
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	18	36	107	171	170	117	81	117	126	63	0	0	

MONTH NOV
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	21	21	21	11	11	.	11	11	.	21	11	.	139
.50 - .99	.	11	64	32	64	43	11	.	32	64	21	32	.	374
1.00 - 1.49	.	.	.	32	43	53	.	.	11	21	11	32	.	203
1.50 - 1.99	.	.	.	.	11	.	.	.	.	11	11	11	.	44
2.00 - 2.49	.	.	.	.	.	.	.	.	.	21	11	32	.	64
2.50 - 2.99	.	.	.	.	.	11	21	.	.	11	21	.	.	64
3.00 - 3.49	.	.	.	.	.	.	.	.	.	21	21	.	.	42
3.50 - 3.99	.	.	.	.	.	.	.	.	21	21	.	21	.	63
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	11	.	11
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	32	85	85	129	118	32	11	75	170	117	150	0	

MONTH DEC
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	.	.	.	30	10	.	20	.	10	20	20	.	110
.50 - .99	.	10	30	10	119	50	40	59	40	40	10	.	.	408
1.00 - 1.49	.	.	20	40	79	99	.	50	30	20	20	.	.	358
1.50 - 1.99	.	.	.	30	20	10	.	.	10	.	10	.	.	80
2.00 - 2.49	.	.	.	.	.	.	.	.	.	30	.	.	.	30
2.50 - 2.99	.	.	.	.	.	.	.	.	.	20	.	.	.	20
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	10	50	80	248	169	40	129	80	120	60	20	0	

(Sheet 4 of 4)

Table B33

1980 Plus 1981 Annual and Seasonal Joint Distribution of Wave Height Versus Peak Period for Gage 610

ANNUAL
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	4	4	8	9	18	43	43	32	11	28	19	3	222
.50 - .99	1	12	28	43	48	33	60	46	53	41	27	23	.	415
1.00 - 1.49	.	.	6	21	42	26	20	13	24	14	24	8	.	198
1.50 - 1.99	.	.	1	5	17	11	7	7	9	5	12	11	.	85
2.00 - 2.49	.	.	.	1	.	8	2	3	7	7	9	7	.	44
2.50 - 2.99	.	.	.	.	1	3	4	3	2	5	3	3	.	24
3.00 - 3.49	.	.	.	.	.	.	1	2	1	2	4	2	.	12
3.50 - 3.99	.	.	.	.	.	.	.	.	1	2	.	1	.	4
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	1	.	1
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	1	16	39	78	117	99	137	117	129	87	107	75	3	

SEASONAL JAN-MAR
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	.	6	3	6	6	14	31	23	6	31	6	.	132
.50 - .99	.	14	3	28	42	31	42	28	59	11	51	23	.	332
1.00 - 1.49	.	.	11	25	42	20	8	17	37	17	68	20	.	265
1.50 - 1.99	.	.	3	3	23	11	8	14	28	11	17	25	.	143
2.00 - 2.49	.	.	.	3	.	6	3	6	14	6	11	17	.	66
2.50 - 2.99	.	.	.	.	.	3	3	6	6	8	6	11	.	43
3.00 - 3.49	.	.	.	.	.	.	3	3	3	.	11	3	.	23
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	14	23	62	113	77	81	105	170	59	195	105	0	

SEASONAL APR-JUN
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	4	6	17	21	33	66	45	35	2	31	21	.	281
.50 - .99	4	14	48	66	23	45	110	70	45	48	14	29	.	516
1.00 - 1.49	.	.	4	14	25	10	33	14	27	.	6	.	.	133
1.50 - 1.99	.	.	.	4	8	6	4	10	2	.	4	2	.	40
2.00 - 2.49	.	.	.	.	.	4	2	2	8	2	6	.	.	24
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	2	.	2
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	4	18	58	101	77	93	215	141	117	52	61	54	0	

(Continued)

Table B33 (Concluded)

SEASONAL JUL-SEP
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	8	.	8	3	22	63	93	60	22	5	27	3	314
.50 - .99	.	8	14	33	38	25	69	55	74	49	38	22	.	425
1.00 - 1.49	.	.	.	14	47	19	14	5	22	11	16	8	.	156
1.50 - 1.99	.	.	.	3	8	.	5	3	3	5	16	5	.	48
2.00 - 2.49	.	.	.	.	.	.	.	.	.	5	16	5	.	26
2.50 - 2.99	.	.	.	.	.	3	.	.	.	5	.	5	.	13
3.00 - 3.49	.	.	.	.	.	.	.	5	.	3	.	3	.	11
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	16	14	58	96	69	151	161	159	100	91	75	3	

SEASONAL OCT-DEC
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	3	3	3	6	13	31	19	17	16	36	20	6	173
.50 - .99	.	11	35	39	75	30	28	31	42	47	17	20	.	375
1.00 - 1.49	.	.	8	27	52	44	20	13	16	24	17	6	.	227
1.50 - 1.99	.	.	2	8	27	20	9	3	6	6	13	13	.	107
2.00 - 2.49	.	.	.	.	.	17	2	5	5	13	5	6	.	53
2.50 - 2.99	.	.	.	.	2	6	9	5	3	6	6	.	.	37
3.00 - 3.49	.	.	.	.	.	.	2	2	.	5	6	.	.	15
3.50 - 3.99	.	.	.	.	.	.	.	.	3	5	.	3	.	11
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	2	.	2
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	14	48	77	162	130	101	78	92	122	100	70	6	

Table B34

1980 Plus 1981 Monthly Joint Distribution of Wave Height

Versus Peak Period for Gage 610

MONTH JAN
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	.	8	8	8	8	33	50	41	.	17	.	.	173
.50 - .99	.	25	.	17	33	50	33	25	66	8	25	.	.	282
1.00 - 1.49	.	.	17	17	83	8	8	17	33	.	41	.	.	224
1.50 - 1.99	.	.	8	.	41	25	8	25	8	17	.	8	.	140
2.00 - 2.49	.	.	.	.	.	17	8	8	17	8	8	17	.	83
2.50 - 2.99	.	.	.	.	.	8	.	8	17	17	8	17	.	75
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	17	8	.	25
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	25	33	42	165	116	90	133	182	50	116	50	0	

MONTH FEB
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	.	14	.	.	14	.	.	.	29	71	14	.	142
.50 - .99	.	.	.	57	57	29	29	14	86	14	100	.	.	386
1.00 - 1.49	.	.	.	29	29	29	14	57	43	14	43	.	.	258
1.50 - 1.99	.	.	.	14	14	.	14	14	71	14	.	.	.	141
2.00 - 2.49	.	.	.	.	.	.	.	14	43	14	.	.	.	71
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	0	14	100	100	72	57	99	243	85	214	14	0	

MONTH MAR
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	.	.	.	6	.	6	30	18	.	24	6	.	90
.50 - .99	.	12	6	24	43	18	55	37	43	12	49	49	.	348
1.00 - 1.49	.	.	12	30	18	24	6	.	37	30	98	43	.	298
1.50 - 1.99	.	.	.	.	12	6	6	6	24	6	37	49	.	146
2.00 - 2.49	.	.	.	6	.	.	.	.	.	.	18	24	.	48
2.50 - 2.99	.	.	.	.	.	.	6	6	.	6	6	12	.	36
3.00 - 3.49	.	.	.	.	.	.	6	6	6	.	12	.	.	30
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	12	18	60	79	48	65	85	128	54	244	183	0	

(Continued)

(Sheet 1 of 4)

Table B34 (Continued)

MONTH APR
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	6	.	6	19	25	50	19	31	.	63	44	.	263
.50 - .99	13	13	25	25	19	57	50	57	88	126	13	82	.	568
1.00 - 1.49	.	.	6	13	19	6	19	13	13	.	13	.	.	102
1.50 - 1.99	.	.	.	.	.	19	6	6	.	.	6	6	.	43
2.00 - 2.49	.	.	.	.	.	.	.	.	6	6	13	.	.	25
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	13	19	31	44	57	107	125	95	138	132	108	132	0	

MONTH MAY
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	.	5	5	10	31	72	56	36	5	15	15	.	250
.50 - .99	.	.	56	56	31	51	77	67	31	15	26	5	.	415
1.00 - 1.49	.	.	5	26	46	21	56	21	56	.	5	.	.	236
1.50 - 1.99	.	.	.	10	21	.	5	21	5	.	.	.	.	62
2.00 - 2.49	.	.	.	.	.	10	5	.	10	.	5	.	.	30
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	5	.	5
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	0	66	97	108	113	215	165	138	20	51	25	0	

MONTH JUN
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	8	15	46	38	46	77	62	38	.	15	.	.	345
.50 - .99	.	38	62	131	15	23	231	92	15	.	.	.	.	607
1.00 - 1.49	.	.	.	.	.	.	15	8	.	.	.	.	.	23
1.50 - 1.99	.	.	.	.	.	.	.	.	.	.	8	.	.	8
2.00 - 2.49	.	.	.	.	.	.	.	8	8	.	.	.	.	16
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	46	77	177	53	69	323	170	61	0	23	0	0	

(Continued)

(Sheet 2 of 4)

MONTH JUL
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	30	.	10	.	40	129	139	89	.	.	50	.	487
.50 - .99	.	30	30	50	50	20	129	69	.	.	.	.	.	378
1.00 - 1.49	.	.	.	20	59	10	30	10	10	.	.	.	.	139
1.50 - 1.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	60	30	80	109	70	288	218	99	0	0	50	0	

MONTH AUG
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	.	.	17	9	26	70	122	61	35	.	9	.	349
.50 - .99	.	.	17	43	35	26	70	61	78	61	.	9	.	400
1.00 - 1.49	.	.	.	9	52	26	.	.	9	9	.	.	.	105
1.50 - 1.99	.	.	.	.	9	.	9	.	.	.	17	9	.	44
2.00 - 2.49	.	.	.	.	.	.	.	.	.	17	26	9	.	52
2.50 - 2.99	.	.	.	.	.	9	.	.	.	17	.	.	.	26
3.00 - 3.49	.	.	.	.	.	.	.	17	.	9	.	.	.	26
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	0	17	69	105	87	149	200	148	148	43	36	0	

MONTH SEP
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	.	.	.	.	7	14	41	41	27	14	27	7	178
.50 - .99	.	.	.	14	34	27	27	41	122	74	95	47	.	481
1.00 - 1.49	.	.	.	14	34	20	14	7	41	20	41	20	.	211
1.50 - 1.99	.	.	.	7	14	.	7	7	7	14	27	7	.	90
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	20	7	.	27
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	14	.	14
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	7	.	7
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	0	0	35	82	54	62	96	211	135	197	129	7	

(Continued)

(Sheet 3 of 4)

Table B34 (Concluded)

MONTH OCT
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS)													TOTAL
	1.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 10.9	11.0- 11.9	12.0- 13.9	14.0- 16.9	17.0- LONGER	
0.00 - .49	.	.	.	.	.	14	60	28	28	14	23	18	.	185
.50 - .99	.	9	23	51	74	14	32	32	69	51	23	23	.	401
1.00 - 1.49	.	.	9	23	51	9	28	5	14	14	23	.	.	176
1.50 - 1.99	.	.	.	5	28	18	14	5	5	14	5	.	.	94
2.00 - 2.49	.	.	.	.	.	46	.	14	9	14	5	.	.	88
2.50 - 2.99	.	.	.	.	5	14	14	9	5	.	9	.	.	56
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	5	.	.	.	5
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	9	32	79	158	115	148	93	130	112	88	41	0	

MONTH NOV
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS)													TOTAL
	1.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 10.9	11.0- 11.9	12.0- 13.9	14.0- 16.9	17.0- LONGER	
0.00 - .49	.	9	9	9	5	9	33	19	14	5	38	19	.	169
.50 - .99	.	9	47	28	66	28	28	19	23	47	14	38	.	347
1.00 - 1.49	.	.	.	23	47	56	14	5	9	23	19	19	.	215
1.50 - 1.99	.	.	5	5	23	28	14	5	.	5	23	38	.	146
2.00 - 2.49	.	.	.	.	.	.	5	.	.	9	9	19	.	42
2.50 - 2.99	.	.	.	.	.	5	9	.	.	5	9	.	.	28
3.00 - 3.49	.	.	.	.	.	.	.	.	.	9	9	.	.	18
3.50 - 3.99	.	.	.	.	.	.	.	.	9	9	.	9	.	27
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	5	.	5
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	18	61	65	141	126	103	48	55	112	121	147	0	

MONTH DEC
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS)													TOTAL
	1.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	10.0- 10.9	11.0- 11.9	12.0- 13.9	14.0- 16.9	17.0- LONGER	
0.00 - .49	.	.	.	.	14	14	.	10	10	29	48	24	19	168
.50 - .99	.	14	34	39	87	48	24	43	34	43	14	.	.	380
1.00 - 1.49	.	.	14	34	58	68	19	29	24	34	10	.	.	290
1.50 - 1.99	.	.	.	14	29	14	.	.	14	.	10	.	.	81
2.00 - 2.49	.	.	.	.	.	5	.	.	5	14	.	.	.	24
2.50 - 2.99	.	.	.	.	.	.	5	5	5	14	.	.	.	29
3.00 - 3.49	.	.	.	.	.	.	5	5	.	5	10	.	.	25
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	14	48	87	188	149	53	92	92	139	92	24	19	

(Sheet 4 of 4)

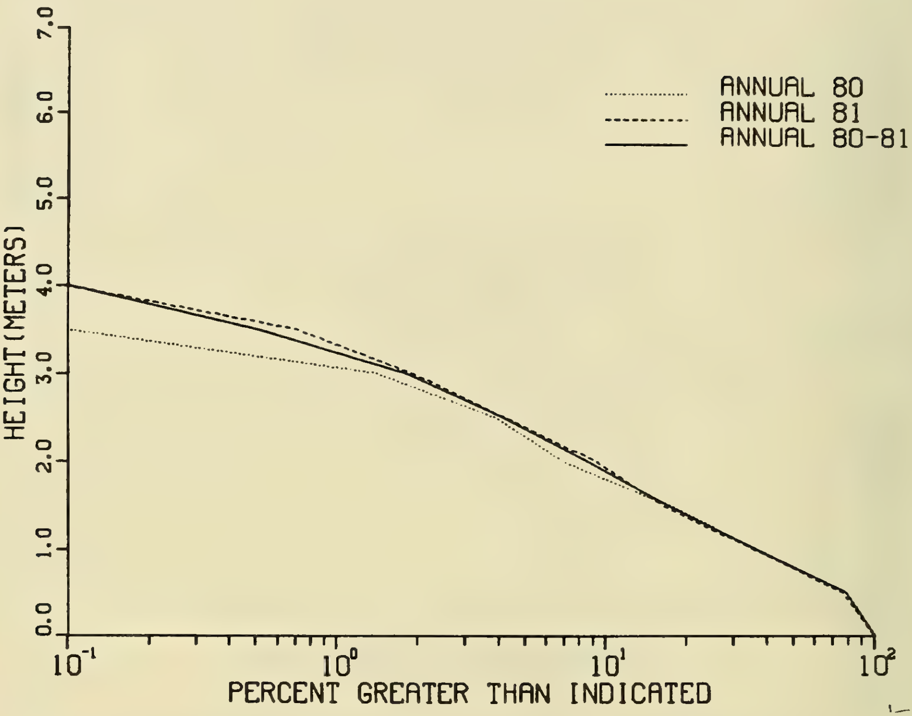
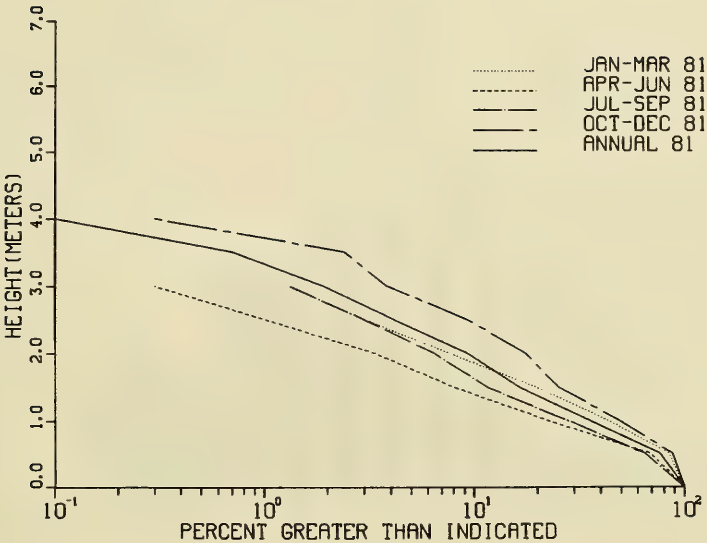
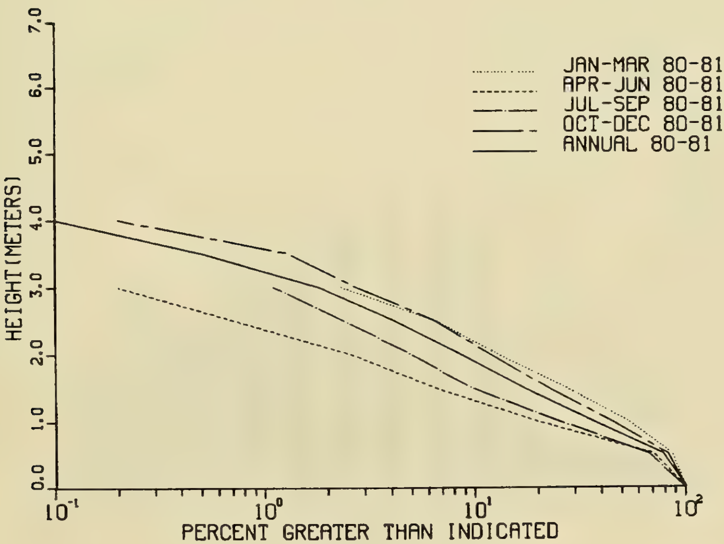


Figure B34. 1981 and 1980 plus 1981 annual cumulative distribution of wave height for gage 610

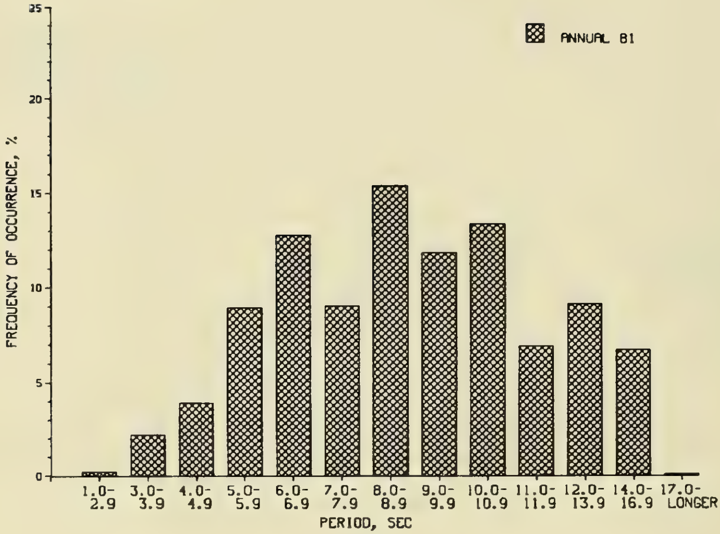


a. 1981

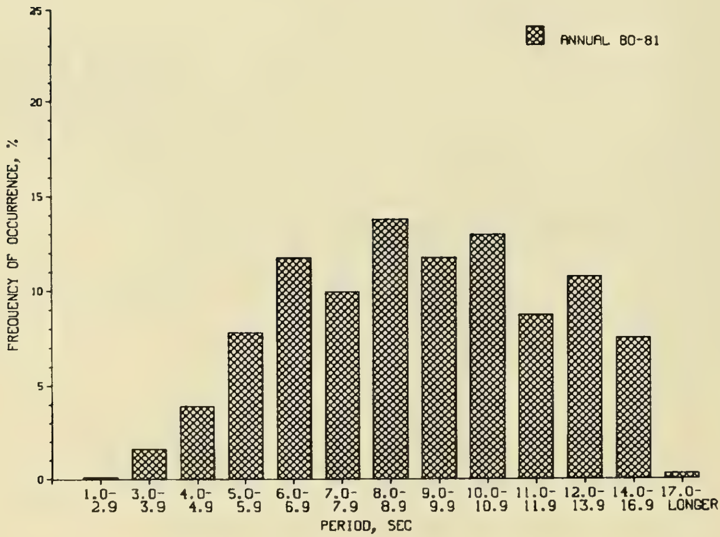


b. 1980 plus 1981

Figure B35. Seasonal and annual cumulative distribution of wave height for gage 610

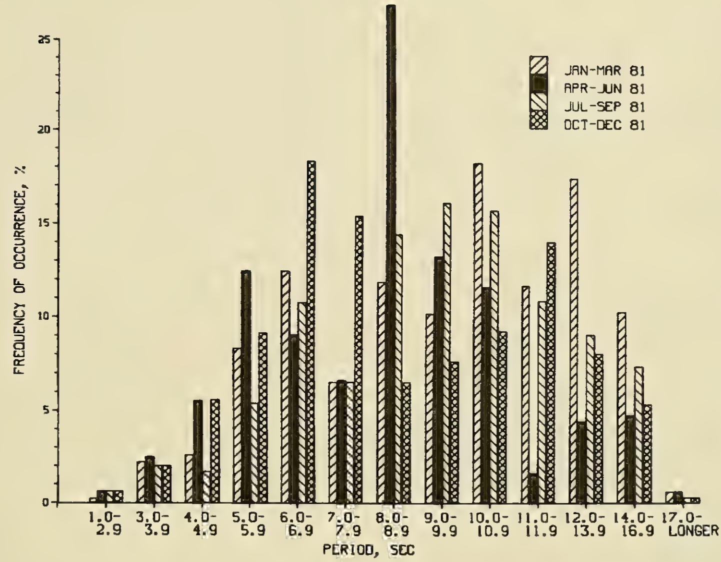


a. 1981

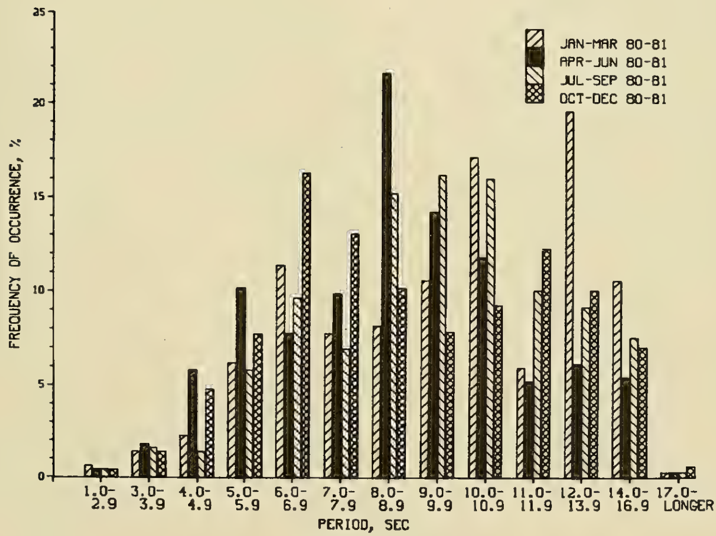


b. 1980 plus 1981

Figure B36. Annual peak spectral wave period distribution for gage 610



a. 1981



b. 1980 plus 1981

Figure B37. Seasonal peak spectral wave period distribution for gage 610

Table B35

Persistence of 1981 Wave Heights for Gage 610

	Consecutive Day(s)																												
Height, m	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	42	47	60
0.5	13	12			11		10				9							7	6							5	4	3	2
1.0	46	39	34	27	21	15	12	8	7			4	3					2			1								
1.5	50	27	18	10	9	7	5		1																				
2.0	35	17	8	6	4																								
2.5	18	10	5	2																									
3.0	11	3		1																									
3.5	3		1																										
4.0	1																												

Table B36

Persistence of 1980 Plus 1981 Wave Heights for Gage 610

	Consecutive Day(s)																								
Height, m	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1.0	42	32	23		14		9	8	7			4	2								1				
1.5	34	20	14	9	7	5	3		1																
2.0	25	11	6	4	3																				
2.5	13	7	4	2																					
3.0	8	3		1																					
3.5	2		1																						
4.0	1																								

APPENDIX C: SURVEY DATA

Time History Graphs of Bottom Elevations (Figures C1 and C2)

1. Each graph shows how the bottom elevation varied throughout the year. The vertical datum is National Geodetic Vertical Datum (NGVD), and the horizontal datum is the monumentation baseline.

Contour Diagrams (Figures C3 through C7)

2. Contour diagrams were constructed from the bathymetric survey data. The profile lines surveyed are identified on each diagram. Contours are in half meters referenced to NGVD.

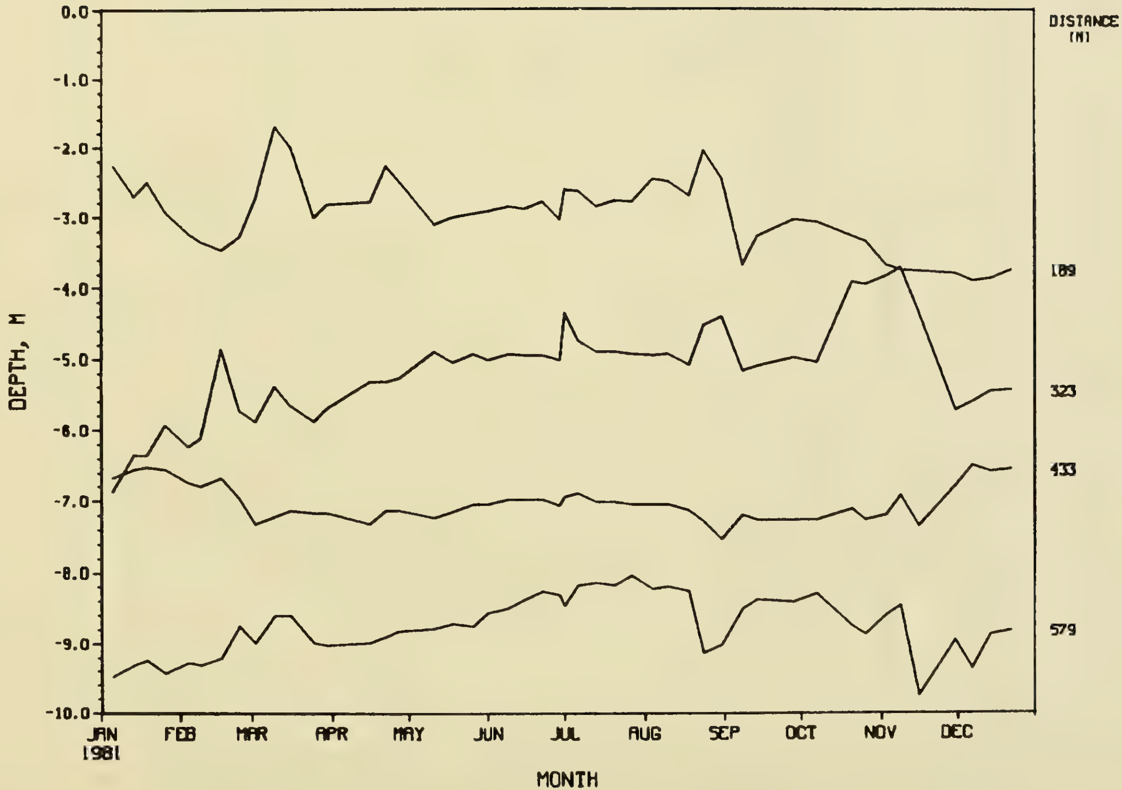


Figure C1. Time history of bottom elevations at selected locations along the FRF pier, north side

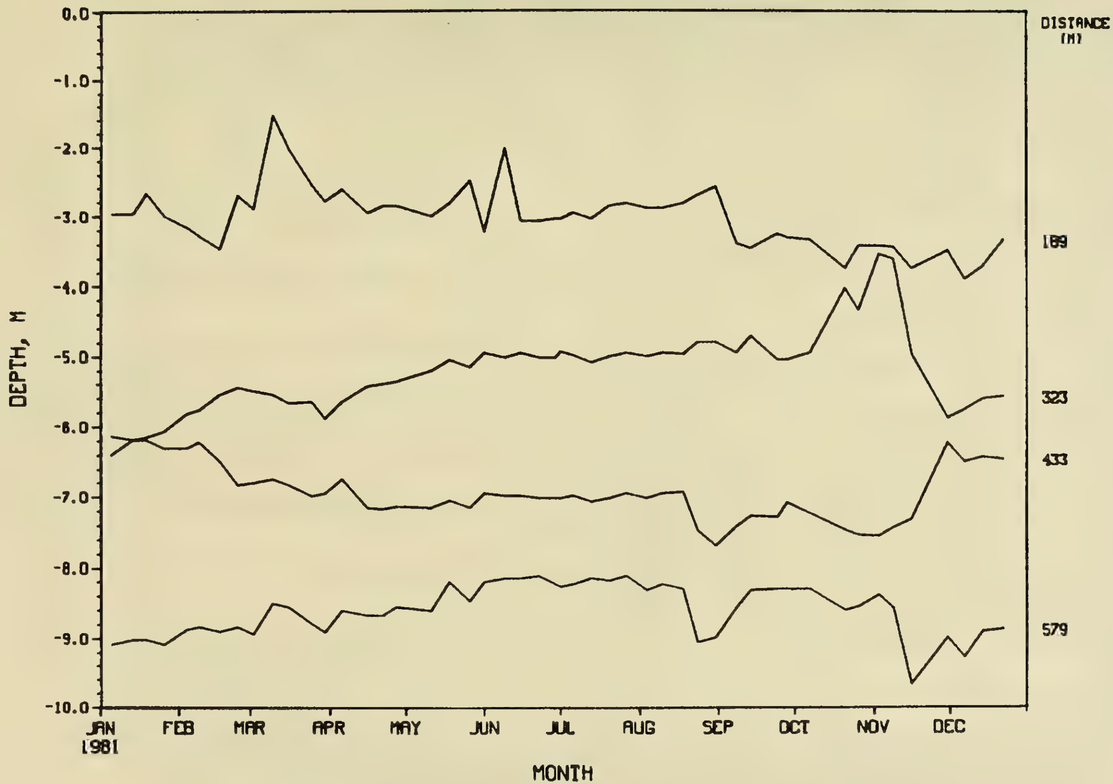


Figure C2. Time history of bottom elevations at selected locations along the FRF pier, south side

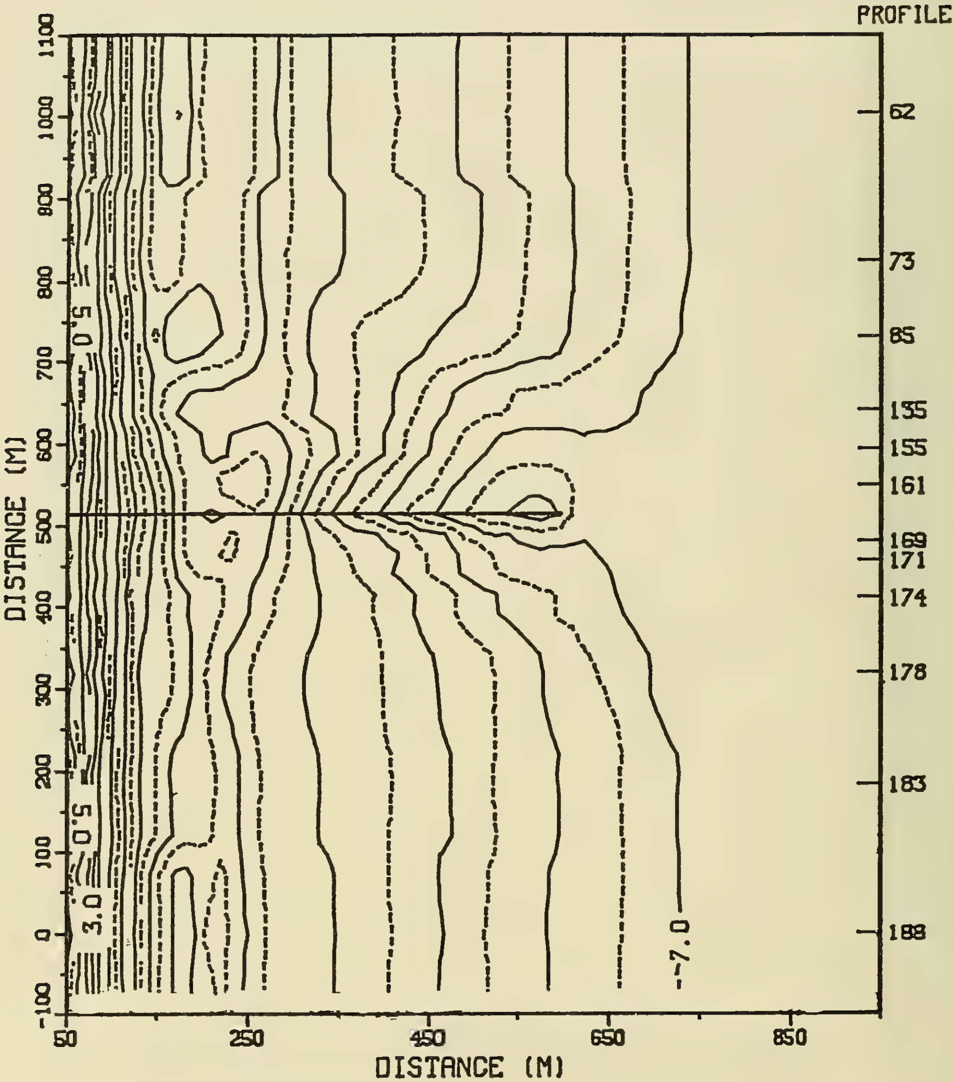


Figure C3. FRF bathymetry for 2 July 1981, contours in meters

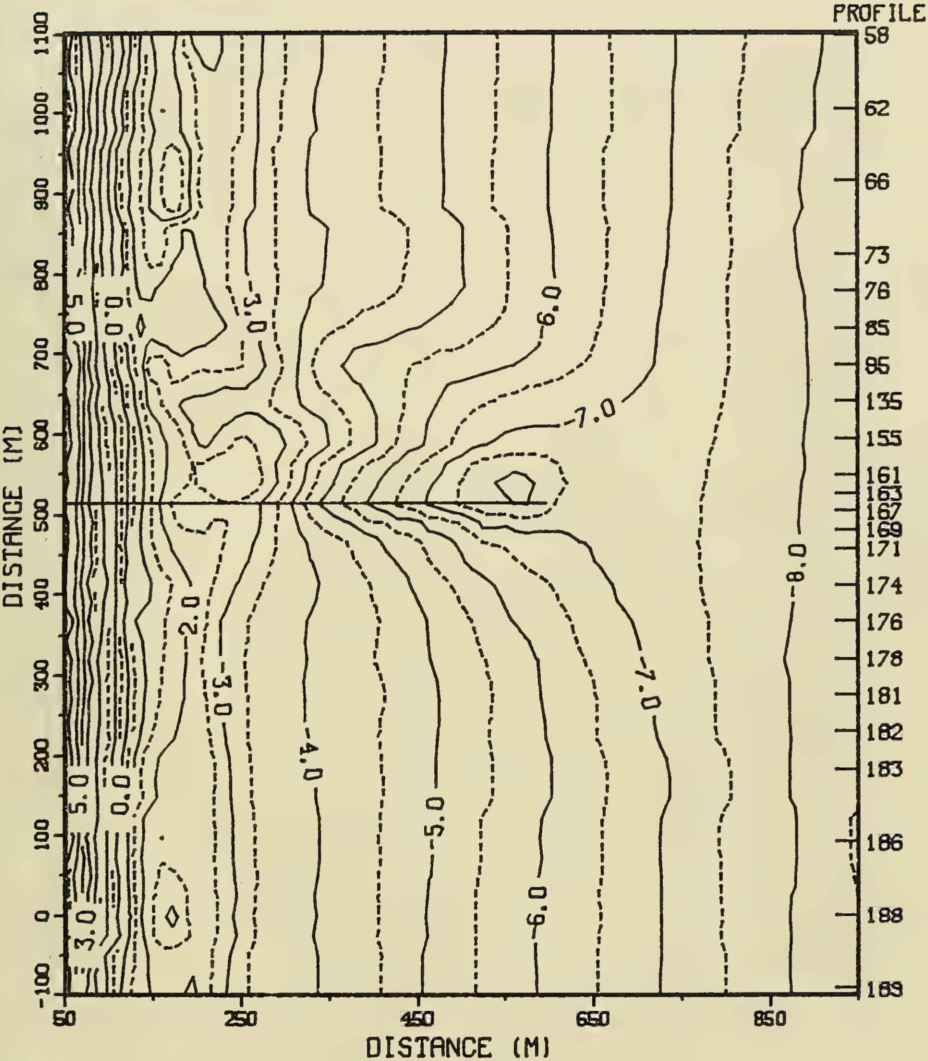


Figure C4. FRF bathymetry for 17 July 1981, contours in meters

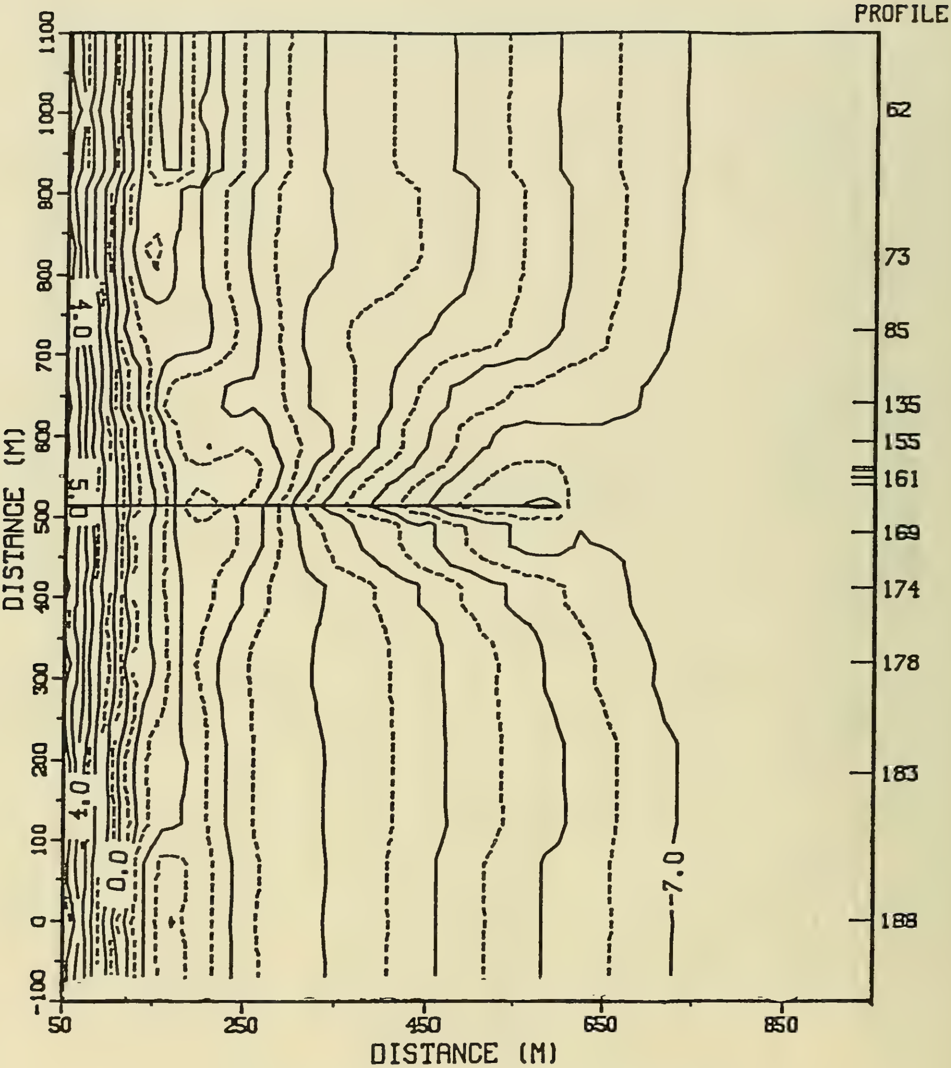


Figure C5. FRF bathymetry for 4 August 1981, contours in meters

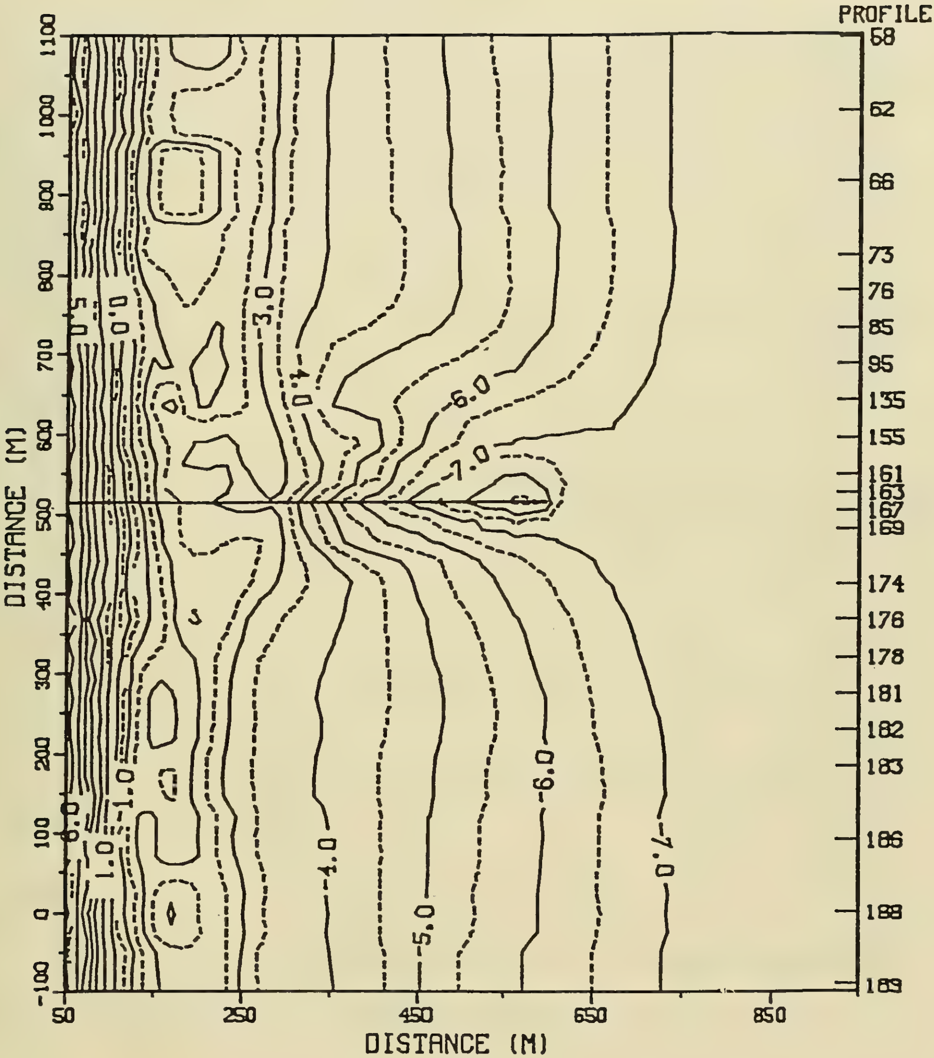


Figure C6. FRF bathymetry for 24 August 1981, contours in meters

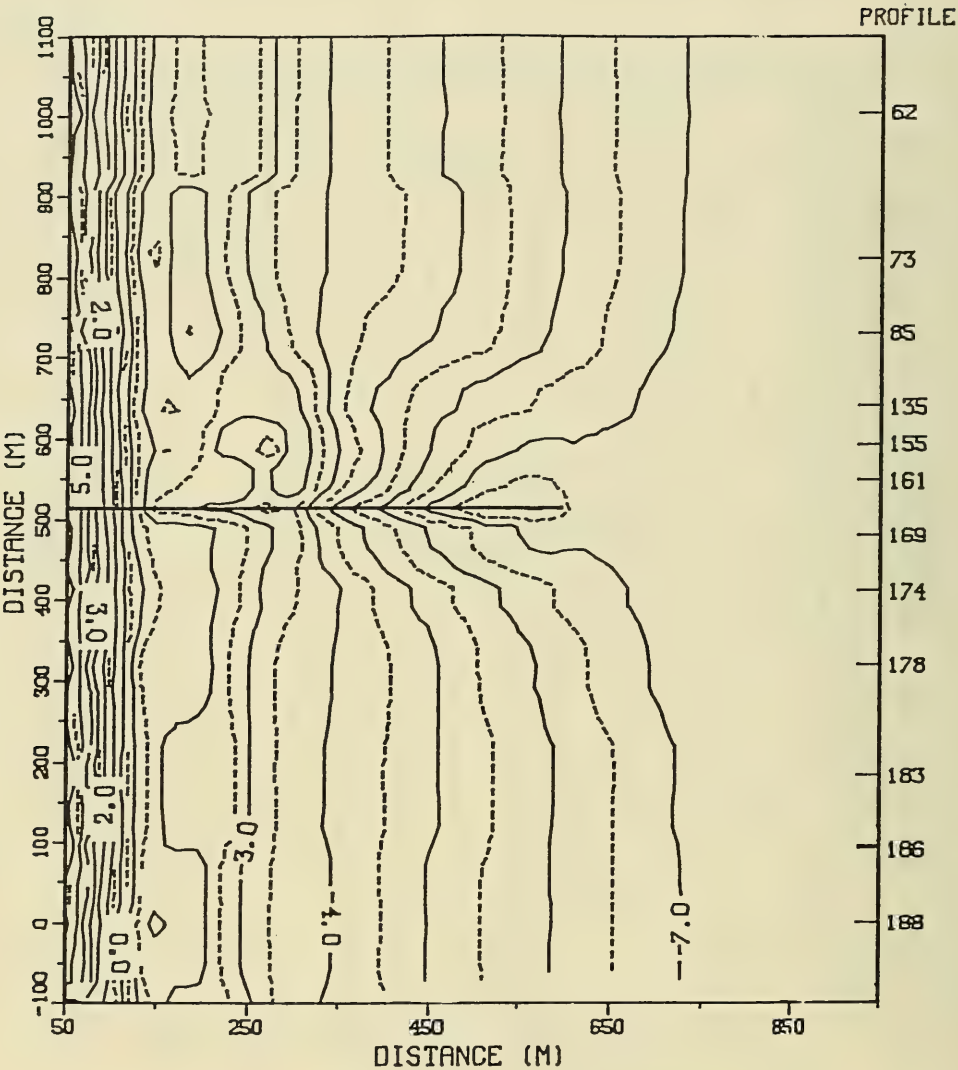


Figure C7. FRF bathymetry for 19 September 1981, contours in meters

APPENDIX D: STORM DATA

1. This appendix presents a summary of storm data for 1981 collected hourly during times when H_{m_o} exceeded 2 m at gage 625, along with a brief explanation of the conditions causing the high waves (Appendix B contains wave spectra for gage 625 on dates when H_{m_o} exceeded 2 m). Storm periods are detailed in the following paragraphs.

21 January (Figure D1)

2. A low formed over Cape Hatteras, with NNE winds up to 15 m/sec producing wave heights up to 2.5 m on 21 January.

11 February (Figure D2)

3. A high-pressure system, originating over the central US moved east arriving offshore of New England on 10 February. Onshore winds persisted throughout 11 February, resulting in wave heights in excess of 2 m during the day.

14 February (Figure D3)

4. A high-pressure system developed on 13 February and remained stationary over the coast of Delaware and Maryland, producing onshore winds and storm waves during 14 February.

23-24 February (Figure D4)

5. A low-pressure system centered over eastern Maryland moved eastward into the Atlantic producing SSE winds on 19 and 20 February; this system continued to affect the coastal wave conditions as it moved offshore. A huge new low developed over Indiana on 22 and 23 February. These two systems resulted in SSE winds of speeds up to 6.7 m/sec and produced 2.8-m, 17-sec waves on 23 February along the coast.

8-9 March (Figure D5)

6. A low-pressure system formed west of Norfolk, Va., on 5 March, with winds of 11 m/sec from the SSE. The low moved well offshore and deepened into a major storm, producing 2.5-m waves on 9 March.

23-24 March (Figure D6)

7. A low-pressure system crossed Cape Hatteras moving NE on 23 March, causing NNE winds up to 14 m/sec. The low continued eastward through 24 March, resulting in wave heights of over 2.5 m.

13-14 April (Figure D7)

8. A Canadian high-pressure system pushed a cold front past the FRF on 13 April. The high moved south along the New England coast throughout 14 April, resulting in high waves at the FRF.

4 May (Figure D8)

9. A low-pressure system off the Delaware coast coupled with a high over western Pennsylvania resulted in northerly winds along the central eastern seaboard causing storm waves at the FRF.

8 May (Figure D9)

10. A low which formed off the New England coast on 3 May produced north winds of up to 6 m/sec and advanced slowly to the SW with ENE winds increasing to 11.8 m/sec.

23 August (Figure D10)

11. Preceded by a large rain umbrella, Tropical Storm Dennis began its northward journey along the southeastern coast early on 19 August and had by the morning of 20 August passed Cape Hatteras, N. C., heading into the north Atlantic where it would quickly intensify to hurricane strength. The

maximum wave height was 3.52 m at 0900 EST on 20 August, with the highest sustained winds of 18.13 m/sec recorded at 0800 EST on 20 August. Waves of 2 m and higher were recorded for 68 consecutive hours (19 August, 1700 hours, through 22 August, 1200 hours). A total of 128 mm of precipitation fell during the storm, with 115 mm falling on 20 August. A large amount of erosion occurred along most of the profile line from the foreshore to the storm bar which was flattened and moved 50 m seaward. Seaward of the storm bar up to 0.7 m of sediment was removed.

3-5 September (Figure D11)

12. Tropical Cyclone Emily developed off Bermuda and curved NE. Combined with a large high-pressure system to the north, Emily produced large swells and high tides. Northeast winds prevailed for two days, reaching 8.7 m/sec and producing 2.8-m waves along the North Carolina coastline.

12-16 October (Figure 12)

13. A low-pressure system moving ENE off Georgia combined with a very large high-pressure system to the north and produced NNE winds up to 14.4 m/sec, with wave heights up to 2.7 m.

30 October-1 November (Figure D13)

14. A very large high-pressure system centered above northeastern Canada produced strong NNE winds for 30 October, with peaks up to 13.3 m/sec.

12-15 November (Figure D14)

15. A combination of a low-pressure system off the North Carolina coast and the syzygy-perigean alignment of the Sun, Moon, and Earth resulted in high waves and water levels with extensive beach changes at the FRF. A cold front which developed in the southwest part of Canada during the weekend of 7 November moved across the United States and passed the FRF (Outer Banks) on Tuesday, 10 November. A low-pressure system, centered in the Gulf of Mexico at that time, moved across Florida on 11 November and up the east coast.

On 12 November, the low stalled off the North Carolina/Virginia coast where it remained through 14 November before moving to the north. Wave heights measured at the nearshore Waverider (gage No. 610) were in excess of 3 m from 12-14 November, while water levels remained almost continuously above the mean water level, with an extreme of 1.49 m above the local mean sea level. After the storm, major seaward shifts of all contour lines between +3 m and -7 m were apparent, with a maximum shift of 80 m occurring on the -4 m contour at the 300-m position on the baseline. The ever-present hole at the end of the FRF pier deepened considerably from -8 m to almost -10 m and expanded to the southwest about 50 m. In addition, a 4-m-deep trench, 75 m wide and extending 325 m north and 75 m south of the pier, was created. Survey data collected on a profile line 516 m south of the pier show some dramatic changes to the profile. On the foreshore (70 m to 110 m), a volume loss of -49 cu m/m occurred between elevations of +3.5 m to -0.5 m. A large portion of this (44 cu m/m) was apparently deposited in the nearshore (i.e., the 110- to 180-m) portion of the profile. A 78-m seaward shift of the storm bar resulted in a net loss of 10 cu m/m, with a net average volume loss to the profile of -15 cu m/m.

25-26 November (Figure D15)

16. A low formed over South Carolina on 24 November and moved north and deepened in the vicinity of Cape Hatteras on 25 November. High waves persisted during both days.

5-6 December (Figure D16)

17. A low-pressure system formed over North Carolina and moved offshore, producing winds 6 to 12 m/sec and 2.6-m wave heights.

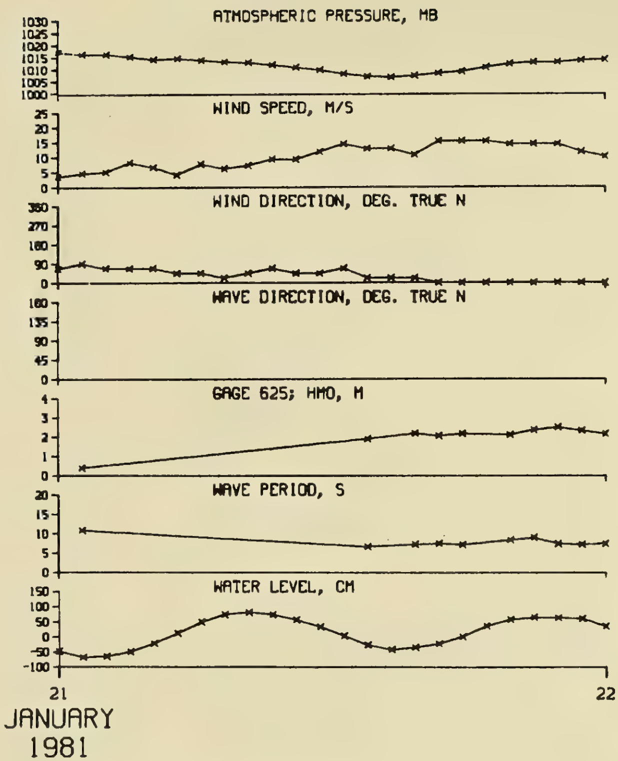


Figure D1. Storm data for 21 January 1981

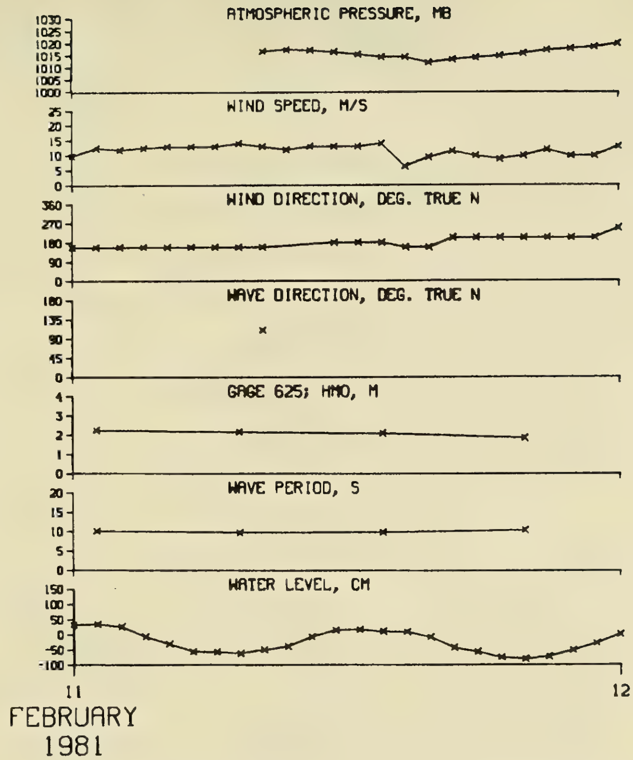


Figure D2. Storm data for 11 February 1981

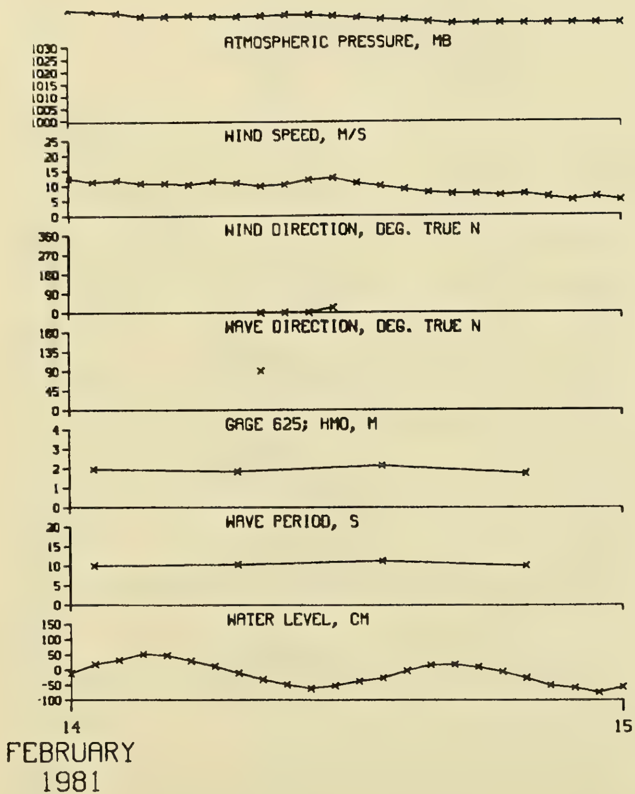


Figure D3. Storm data for
14 February 1981

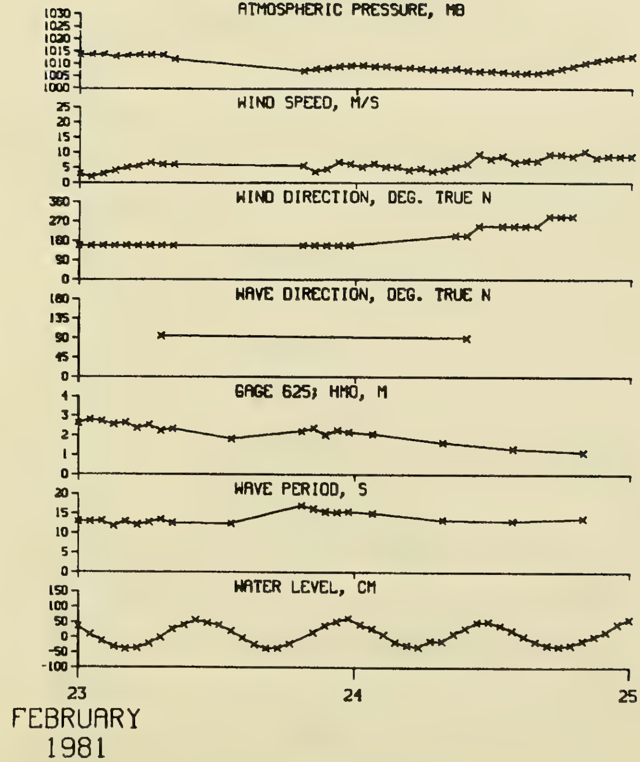


Figure D4. Storm data for
23-24 February 1981

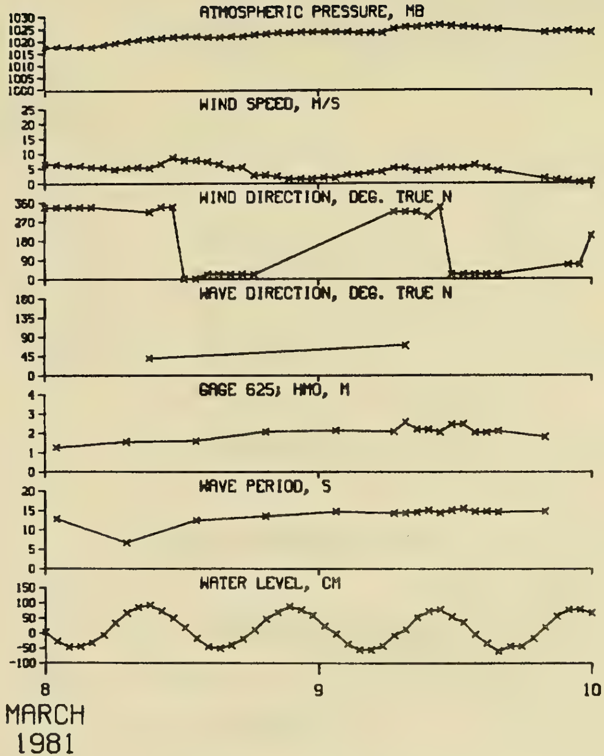


Figure D5. Storm data for
8-9 March 1981

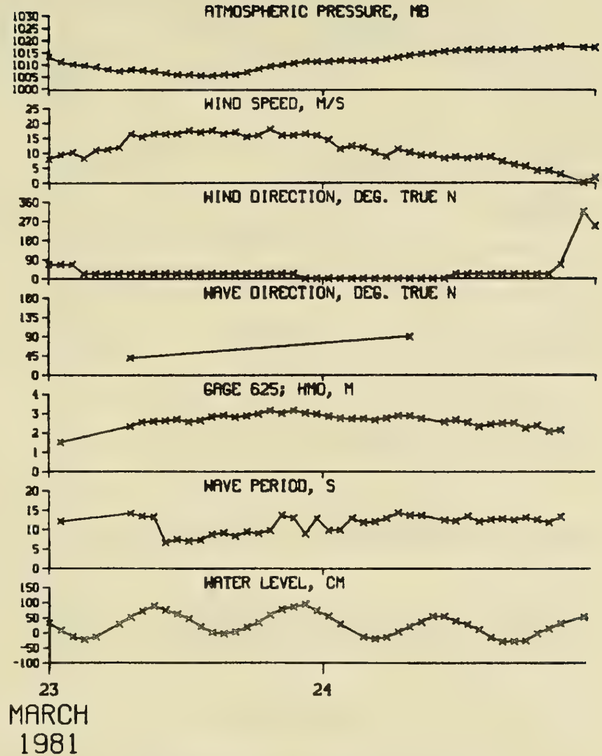


Figure D6. Storm data for
23-24 March 1981

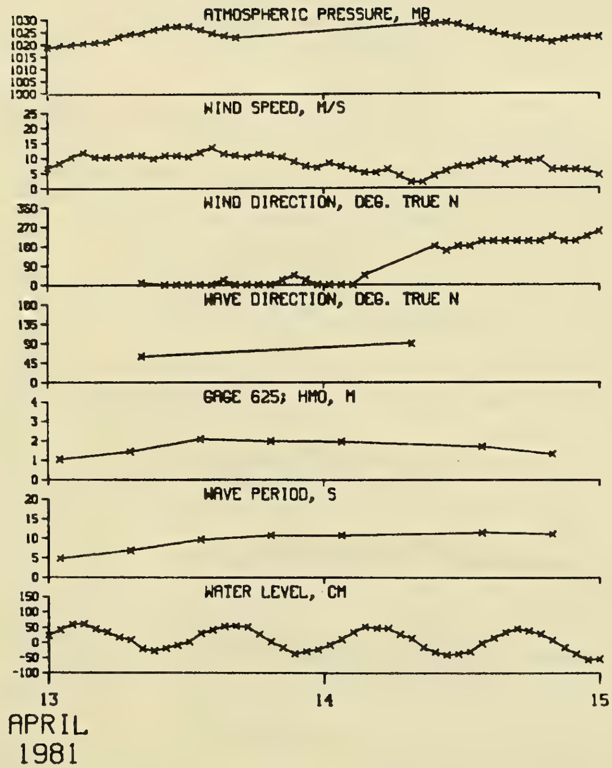


Figure D7. Storm data for 13-14 April 1981

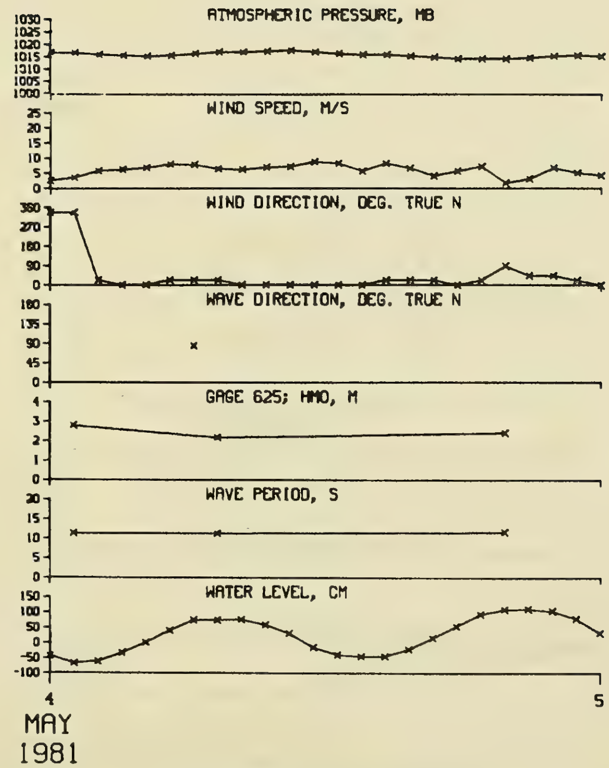


Figure D8. Storm data for 4 May 1981

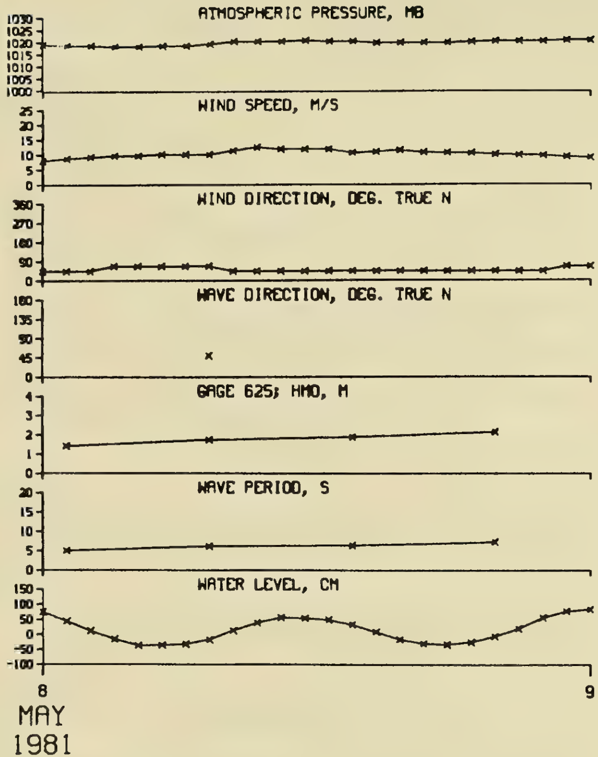


Figure D9. Storm data for
8 May 1981

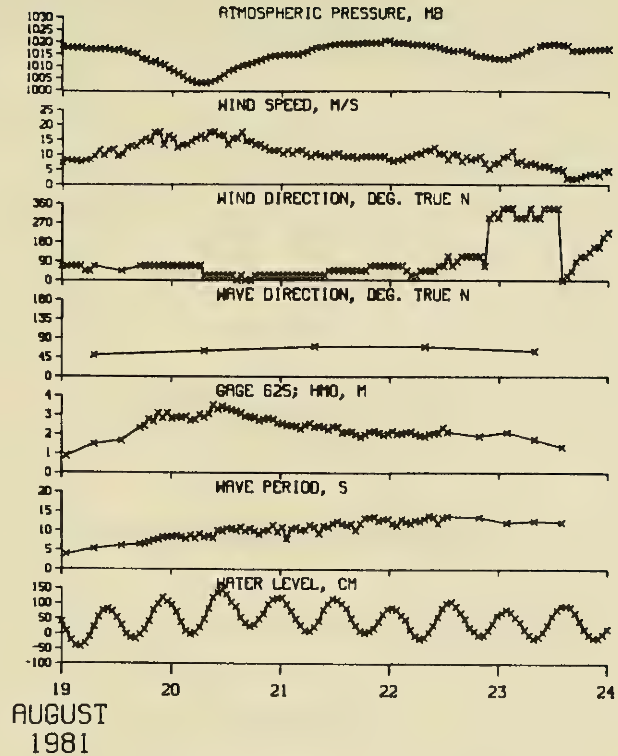


Figure D10. Storm data for
19-23 August 1981

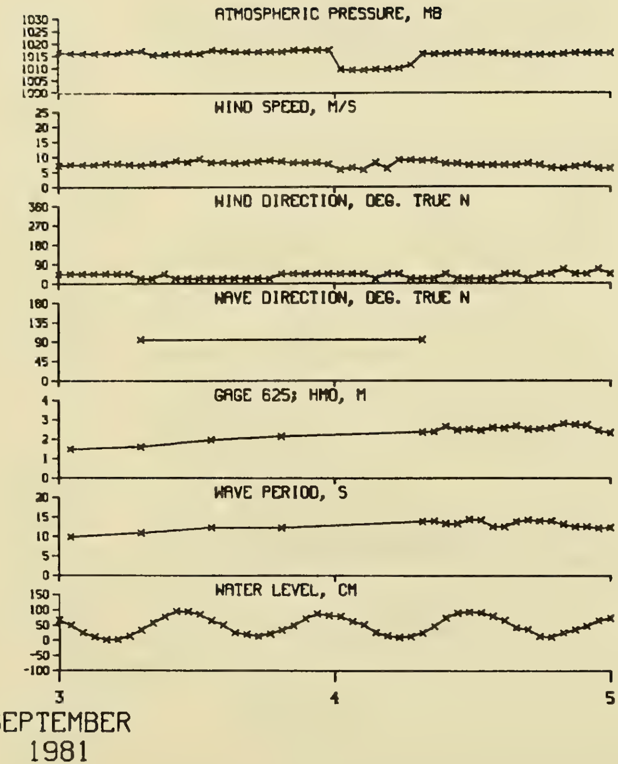


Figure D11. Storm data for
3-5 September 1981

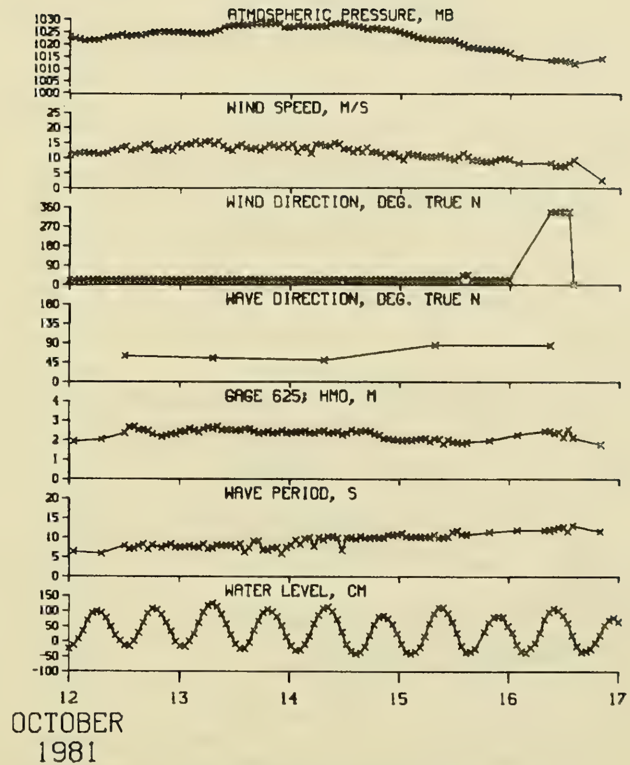


Figure D12. Storm data for
12-16 October 1981

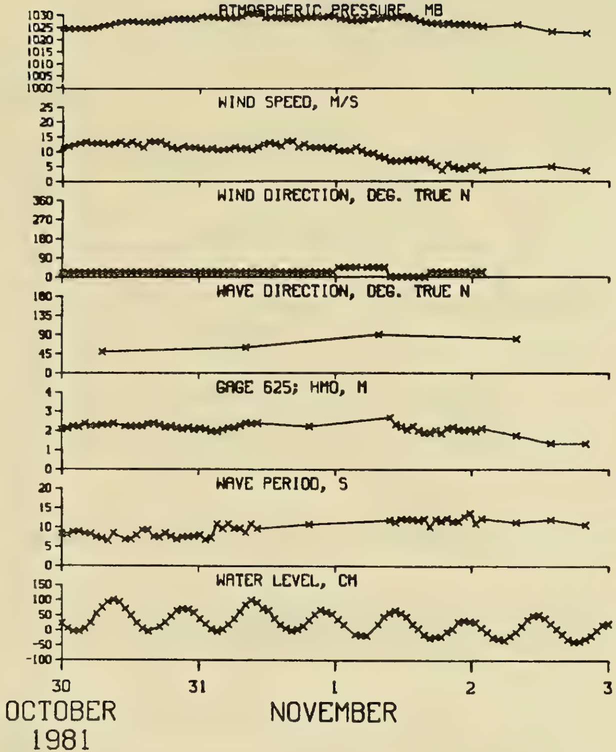


Figure D13. Storm data for 30 October-1 November 1981

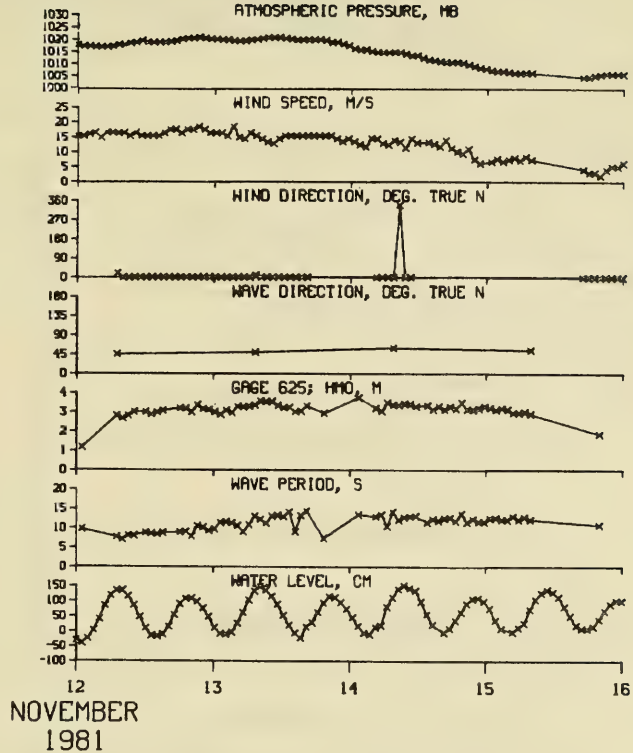


Figure D14. Storm data for 12-15 November 1981

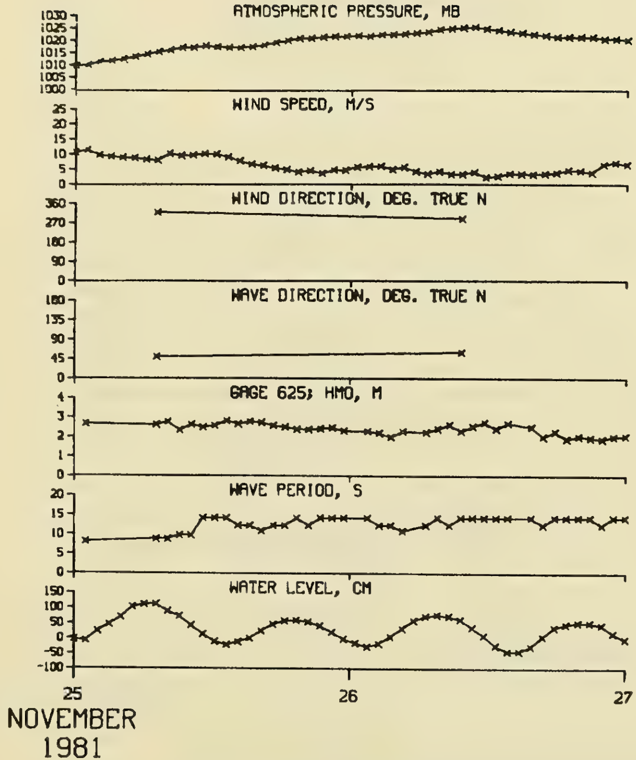


Figure D15. Storm data for
25-26 November 1981

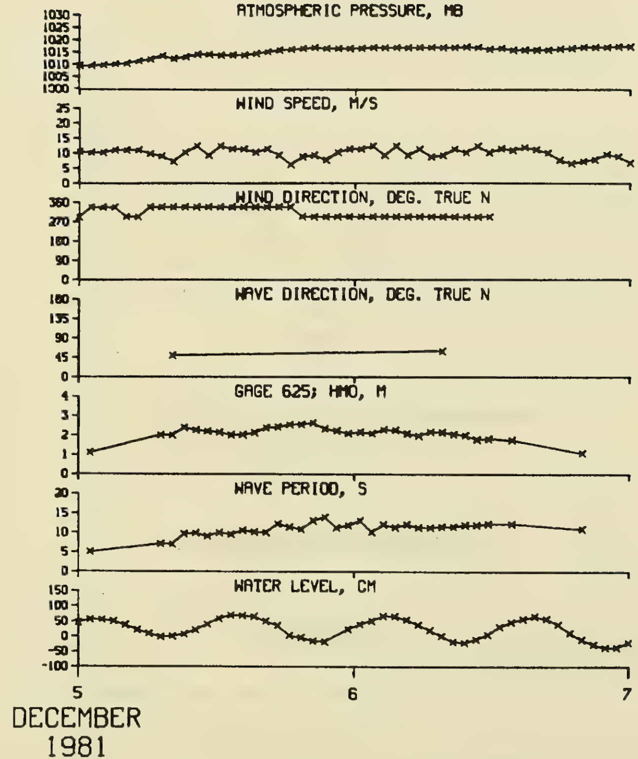


Figure D16. Storm data for
5-6 December 1981